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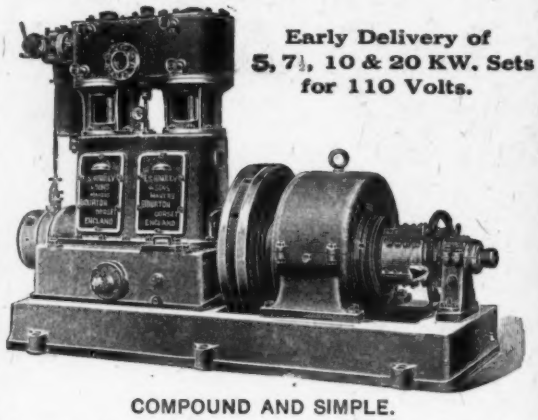

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THE

# ELECTRICAL REVIEW.

VOL. XC. MAY 12, 1922. No. 2,320.

## ELECTRICAL REVIEW.

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## INDUSTRIAL GERMANY IN 1921.

THE Department of Overseas Trade has issued a report on the Economic and Financial Conditions in Germany to March, 1922, which has been prepared by Mr. J. W. F. Thelwall, Commercial Secretary to H.M. Embassy, Berlin, and Mr. C. J. Kavanagh, Commercial Secretary, the Occupied Territories, &c., Cologne.

The report, including the appendices, covers nearly two hundred pages, and is more up-to-date in certain respects than its predecessors. It is divided into seven parts, and should be useful as a record of many branches of German industry in 1921 and partly also in 1920. But as conditions in Germany are constantly subject to rapid changes under existing circumstances, much of the information, particularly the statistics as to prices, cannot apply to the actual situation at the present moment.

The financial part written by the Commercial Secretary at Berlin will well repay perusal. In the introduction the author, in dealing with the currency problem and the depreciation of the mark, states—and does so with good reason—that the practically universal habit of emphasising the difficulties of the country without pointing out the many improvements which have taken place since the end of the war, and the inherent strength of the German position, in the end produces a feeling of depression and apprehension outside Germany which is not warranted by the facts, and which finds its expression in loss of confidence in German currency in other countries. During the year Germany was able to attract a large portion of the world's trade in manufactured goods, owing very largely to the low rate of the mark, and in a time of general depression, such as at present, this alone is a boon of incalculable value. It is also stated that it is the low level of the mark which has enabled the country to return to her former oversea markets and to open new ones; it has enabled the country to proceed rapidly with the reconstruction of the mercantile marine, as German ships, which are paid for in paper marks, can earn freights paid in gold; and it has saved Germany from the crushing burden of unemployment under which the remainder of the world has laboured so heavily. Under these circumstances it is not surprising to hear that a powerful section of the community is in no hurry to see the disappearance of such an effective commercial weapon as the low mark. Apart from this cause, the reader is reminded that further reasons why the Germans can sell at low prices are the inadequate collection of taxes, the subsidies in the form of State purchases of food, cheap price-controlled coal and coke, low railway rates and low postal and telegraph charges, and low wages.

Coming to consider the foreign trade of the country, the report gives in an appendix a comparative table of the imports and exports in 1913 and 1920, while the figures for 1921 are stated only to cover the period of May to December. Those who would like to see the complete figures for the whole year will probably wonder why returns are given for eight months to the exclusion of those for the first four months of that year. The reason is that the German Statistical Board has never published the figures for January to April inclusive, and it is somewhat unfortunate that such an explanation is not afforded by the report. The conclusion is reached by the Commercial Secretary at Berlin—and it is a very correct one—that 1921 for the most part was a period of commercial and industrial success, which is in marked contrast to the financial difficulties of the Reich.

Some thirty pages are devoted to a consideration of the iron and steel and allied trades. In the case of iron and steel, the Commercial Secretary at Cologne thinks that Germany occupies a predominant position in the export trade, but this view of the question is not entertained by the German producers themselves. The latter, as well as other industries, have the advantages of the so-called indirect subsidies previously mentioned, and the benefit of comparatively cheap labour. The present boom in the trade, which is attributed to foreign purchases on account of the collapse in the exchange, speculative merchant buying for higher prices, extensions of plant and the replenishment of stocks, is not considered altogether healthy. The export trade last year was favourable, new capital was readily forthcoming, and the amounts paid away in dividends by a number of companies for the financial year ended with June were very appreciable—in paper marks. Passing on from the further amalgamations and communities of interests which were established last year, the report proceeds to discuss the problem of wages in the metal industries, the important point being brought out that the present tendency is for the wages of the unskilled workman to approach very closely those of the skilled man. The prices given of various iron and steel products are merely of past interest, as quotations have moved still further upwards to a considerable extent since the official report was completed, and the same observation applies to the prices given of the different qualities of coal. As no official figures are available, it is impossible to state the actual production of iron and steel last year, but the report puts the make of steel at 7,500,000 tons. German statements, however, put the total at 8,800,000 tons.

As to the question of mechanical and electrical engineering, the report recalls the fact that the exports of electrical products in 1920 at 67,000 tons were about one half of the exports of 133,000 tons in 1913, but the corresponding figures for 1921 are not available. The electrical trades were kept well occupied on inland requirements last year, electricity supply and telephone extensions and electrical transport developments providing an appreciable amount of work, while the general activity in reconstruction throughout different industries resulted in a keen demand for plant and apparatus of all descriptions. The collapse of the exchange in August, we are told, led to a flood of foreign orders, but many of these engagements are said to have been less remunerative than was originally estimated, owing to the increased cost of raw materials and the further rise in wages. The present tendency amongst engineering firms is to quote on short delivery contracts a fixed price subject to surcharges corresponding to increases in the cost of production since the date of the order.

Proceeding to consider the question of the supply of electrical power, the report refers to the well-known instances of the Rhenish Westphalian Electricity Works Co. and the Communal Electricity Works Association in the same region; to the use of lignite for the production of steam at electricity works and to the prospective more extended use of lignite in the future at works for supplying high-pressure overland transmission lines. In this connection it is mentioned in the coal part of the report that the development of electrical power is gradually altering the whole country's fuel position. This is being effected by the erection of great stations on the site of lignite deposits, in which the brown coal is delivered straight from the mines into the boiler furnaces, and secondly, by means of water-power. The vast schemes for the exploitation of the latter, the report says, will probably take a decade to complete, but in the meantime every year will see an extension of its use. This is the brief intimation given of schemes which certainly are vast, taking into consideration the comparatively limited water-power resources of the country.

The part dealing with labour and the cost of living is worthy of consideration by those who have the time to devote to these problems; the great German chemical industry is entirely overlooked by the report, but shipping, German ports and waterway schemes occupy a large amount of space.

Taken altogether, the report should prove of interest to those who are unfamiliar with the almost daily course of trade and industry in Germany, and also be of value as a record of certain movements in different industries last year. There is, however, one important matter which appears to have entirely escaped attention. We refer to the influence which is being exercised on the cost of production and on the competitive powers of German manufacturers in the world's markets by the constant working of overtime by many workmen who, despite trade unions, willingly put in two or three extra hours a day for the purpose of earning more money for the provision, not of necessities, but of luxuries. If the commercial secretaries could throw some light on this problem in a short report of a few pages, it would be a matter of the greatest interest to manufacturers in general in the United Kingdom.

---

**Electrical Exhibitions.**

Since attending the dinner of exhibitors in connection with the recent Hackney Electrical Exhibition, and marking their enthusiastic appreciation of the manner in which that demonstration was conducted, we have read an interesting editorial article in the *Electrical World* on the practical abandonment of electrical exhibitions in the United States; and it seems that from both sources we may derive some useful hints for the better conduct of such shows.

In the first place, the exhibitors at Hackney laid the greatest stress on the hearty co-operation that they had received from the borough electrical engineer, Mr. L. L. Robinson, and his "live-wire" staff, who spared no effort to ensure and augment the success of the exhibition; "tons of juice" were available, and everything that a manufacturer could wish done by the electricity supply department was done—even to the extent of inaugurating a domestic tariff which will give a severe shock to electricity supply managers in other Metropolitan areas, as it represents a cut of about 50 per cent., and in many cases will mean an all-round figure of less than 1¼d. per kWh. Secondly, the exhibition as a whole represented a judicious selection of apparatus, rather than the bewildering profusion which on former occasions has dazzled and confused the visitor by its excessive variety. Now, the latter is the very feature to which our American contemporary ascribes the disfavour into which the electrical exhibition has fallen in the United States. He says: "Here was a great throng of people come to see. Here was a great display of electrical appliances. They were both in the same place and yet they didn't get together, and the results fell far short of the opportunity. And the reason was because always the people were deceived as to what they were to see. *They came to see electricity do things and we showed them only appliances.*" The italics are ours, and we think the last sentence goes to the root of the matter. The public wants to see electric cookers cook real food; to see the washer wash soiled linen; to be educated in electrical *operations*—and the author outlines a system of conducting "a functional electric show" which is well worth the attention of our supply managers and their indefatigable foster-mother, E.D.A. Lastly, we may refer to the importance of making a charge of admission to an exhibition of this kind, as was done at Hackney, not for the purpose of covering the expenses, but for two reasons—to exclude, at least in part, the throng of mere sight-seers who crowd round demonstrations and prevent consumers, actual or prospective, from deriving the full benefit from them; and to impress the latter with the value of admission to the exhibition, for that which can be had for nothing is generally valued at about the same price. No consumer would be deterred from visiting the exhibition by the imposition of a small charge for admission.

We attach the greatest importance to the holding of these displays and demonstrations as a most valuable and efficient means of educating the public in the advantages of electrical methods; but manufacturers and contractors cannot be expected to spend time and money in supporting them unless they are conducted on the most advantageous lines and hold out good prospects of leading to profitable business.

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**The Purchase Clause.**

There is a clause in the Electricity Bill, which is now before the House of Commons, which is of the utmost financial importance to electricity supply companies, especially the smaller provincial companies. The clause in question (Clause 13) gives power to the Electricity Commissioners to postpone the date at which the local authority has the option of purchase. The Bill provides that the Electricity Commissioners may do this either in the Order under which they constitute a Joint Electricity Authority or else by a Special Order. The Commissioners can, of course, impose such conditions as they think fit. Also, the postponement of the date of purchase has to be agreed to by the local authority in which the powers of purchase are at present vested. Where the Commissioners grant such suspension of date of purchase under an Order constituting a Joint Electricity Authority, they may also impose a sliding scale by which prices and dividends are inter-related.

Such a postponement of the purchase date would be to many companies a concession of the utmost importance, and would materially facilitate their finance. It will be remembered that it was the shortness of the tenure (21 years) in the 1882 Act that stopped company development, and that it was only when the tenure was doubled (42 years) by the 1888 Act that company electricity undertakings could be made sufficiently promising to get the public generally to invest. Indeed, throughout the history of company undertakings this question of tenure has repeatedly cropped up as a big factor to be taken into account when providing finance. Moreover, nowadays when many undertakings are getting within a measurable distance of their purchase date, the question of the length of life of the company becomes more important. To many companies, therefore, the chance of getting an extension, which is held out by the present Bill, should be most welcome. The concession will be all the more valuable if the undertaking is able to get a supply in bulk (from a Joint Authority or elsewhere), since it will then be able to devote its whole capital to the extension of its distributing system and pushing the business commercially. The clause is undoubtedly one of the plums in this particuar legislative pudding.

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**Cable Communications.**

It is rarely that shareholders receive a directors' report so full of vim and breathing so much energy and aggressive business vitality as that issued by the Mackay Companies, dated February 15th, 1922.

The first three pages are devoted to a short historical survey of activities in connection with the establishment of Anglo-American cable communication, followed by an outline of the future policy and activities of the company; and the following paragraph, on page 4, is worthy of note:—

"The new position of the United States in the affairs of the world makes imperative a broad and constructive program on the part of the American cable companies, backed up by the moral and diplomatic assistance of the United States Government. . . ."

Accordingly, the Commercial Cable Co. has entered into an agreement with the German Government, which was executed on January 17th last, for the laying of a cable from New York *via* the Azores to Emden, and this is to be in operation on or before October 1st, 1923. A cable *via* the Azores from New York to France has been decided upon, and power to deal direct with the public in France is being sought. Permission is being sought from the American State Department to lay a second Pacific cable. New offices have been secured in Wormwood Street, and the report also states that a direct wire between London and Antwerp has been leased. It is hoped to secure a wire also between London and Amsterdam or Rotterdam. A new cable steamer, the *John W. Mackay*, was launched during the year. The land-line system is being built up, and an action at law has been decided in the company's favour.

Perhaps the dominant position of American telegraphic enterprises is best shown by a sentence which reads as follows:—

"All of the cables operating between the United States and England are controlled by American companies."

Other cables could be mentioned connecting British Colonies which, although owned by British undertakings, are controlled absolutely by American companies, either through shareholders or agreements, and it is surely time that steps were taken by the British companies, backed by the British Government, to see that the British Empire is bound together by cables under British control.

It is noteworthy that the report under review does not this year refer to wireless activities, and no doubt it has been found illogical to state that communication by radio is only fit for ship and shore work when, as a matter of fact, several trans-Atlantic high-speed automatic duplexed circuits exist, competing with the cable services. Thus, wireless telegraph channels are functioning effectively between the U.S.A. and France, Germany, Norway, and Great Britain, as well as between the U.S.A. and Hawaii Islands and Japan, between London and France, &c., and other long-distance services by wireless are contemplated.

We have often dealt with the importance of providing the Empire with proper telegraphic facilities and advocated "all-red" routes, and it is to be hoped that negotiations now pending for an Imperial chain will be brought to a rapid and successful conclusion. Too much valuable time has unfortunately already been wasted.

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**The Engineering Lock-out.**

Unfortunately at the time of writing there is nothing good to report regarding the lock-out situation. The inquiry has been held, and Sir William Mackenzie has made an effort to bring the parties nearer together, but without success. His report will be awaited with interest—it is stated that it was formally laid on the table at the House of Commons on Tuesday night. We prefer not to form a hasty judgment as to the real influence of the Industrial Court Inquiry on the situation. We are aware that things were said during the proceedings which did not make for peace. One side seemed all along to have little desire for an inquiry, and the position was not made easier by the attempt to draw the men into the works on individual contract arrangements while the investigation was proceeding. On the other hand, allusions to a future altered industrial order are of little use while a dispute is in progress, however high may have been the expectations raised during the war regarding the post-war improvement of Labour's position. It is impossible to forget the desire of extremists to "get 'rid of the masters," to ignore the statements of those who made no secret of the fact that harmonious relations were the last things that they desired, or to overlook Union circulars which expressed the avowed object of "controlling industry." These things all go to the making of atmosphere, and atmosphere means much when efforts are being made to bring about a lasting settlement of the complex question of managerial control. If only Labour could stifle its idealistic extremists and Capital its reactionaries who want things to remain as they were eight or nine years ago, both sides might find it easier to work together amicably, perhaps even under Whitley Councils. Meanwhile, trade is being lost. Union funds grow smaller, the share-out shrinks to 10s. per week, and the spirit of discontent inevitably spreads.

D

# THE SPEARING WATER-TUBE BOILER.

We recently described the new boiler-house plant installed at the Wimbledon Corporation Electricity Works (Electrical Review, October 7th, 1921, p. 485), the chief features of which were two "Spearing" water-tube boilers each having an evaporative capacity of 25,000 lb. of steam per hour. Boilers of this type are not new; a large number of them have been made, some of which have been in service for 12 years, and arrangements have now been completed for the manufacture of the boiler on an adequate scale. For this purpose the Spearing Boiler Co., Ltd., has acquired a controlling interest in the well-known firm of Messrs. Tinkers, Ltd., whose works at Hyde, near Manchester, we visited recently. The Spearing boiler is already being manufactured in these works, and plans have been drawn up for the enlargement of the factory to double the existing capacity.

There are two types of Spearing boiler, the first with a longitudinal drum and the second with a cross drum. The first type is adopted for smaller sizes, and the latter for boilers of larger capacity. Both are of the sectional header class; and the main distinctive features common to both are the downcomer pipes, the reservoir mud drum, the enlarged nipples, and the straight headers.

Taking the last first, the headers are straight, rectangular, and larger in area than usual by 40 per cent. Straight headers have the advantage of affording freer circulation to the steam and water and of being more easily cleaned than the sinuous type. As it is not necessary to stretch the material in construction to the same degree as in the sinuous headers, the thickness of the straight headers is more uniform. Further, it is a simpler matter to make the joints between the straight headers air-tight. The headers are connected to the drums by nipple tubes which are 28 per cent. larger in area than is usually the case—a feature which increases the safe and steady steaming capacity of the boiler.

The reservoir mud drum has to be considered in connection with the downcomer pipe which leads to it from the circulation drum. The function of this pipe—one, two, or more are fitted according to the evaporative capacity of the boiler—is to secure positive circulation from the main steam and water drum through the mud drum to the headers and tubes. The arrangement is well shown in figs. 1 and 2. The internal diameter of the downcomer pipe is usually about 8 in., so that the risk of choking by deposit or incrustation is negligible. In the position which it occupies it is not subjected to excessive temperature. Each pipe is solid-drawn, and is flanged at each end so that it may be bolted to stand-pipes riveted to the steam drum and mud drum respectively. This arrangement enables the downcomer pipe to be readily detached if necessary.

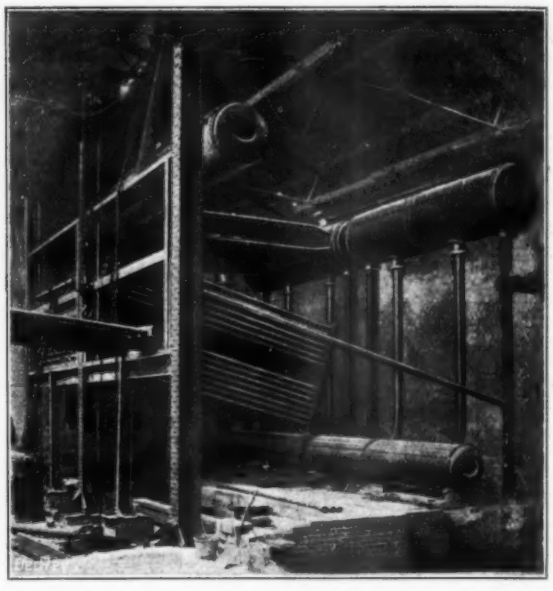
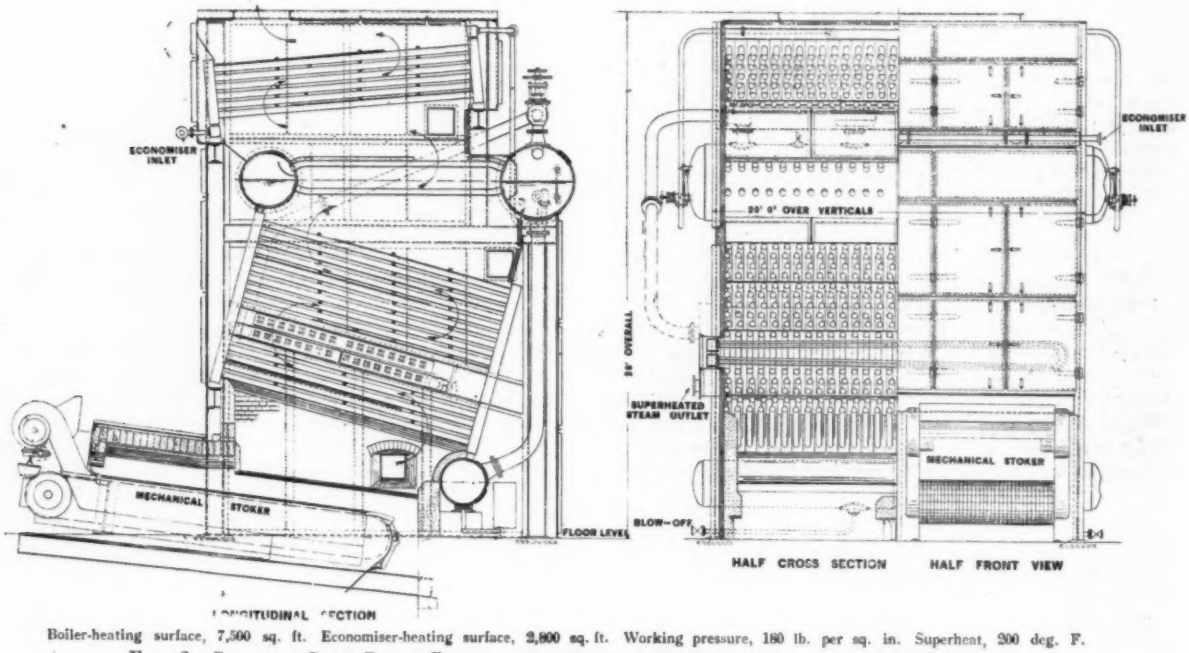


Fig. 1.—Two 25,000-lb. Spearing Boilers in Course of Erection.




Boiler-heating surface, 7,500 sq. ft. Economiser-heating surface, 2,800 sq. ft. Working pressure, 180 lb. per sq. in. Superheat, 200 deg. F.

Fig. 2.—Spearing Cross-Drum Boiler, with Superheater, Economiser, and Mechanical Stoker.

By means of the downcomer pipe all the water is circulated through the mud drum, which collects and retains deposit which would otherwise be distributed through the headers or on the steam generating surfaces.

The mud drum is of ample size, and is easily accessible for cleaning. The water flows from it through short connecting nipples to the back headers, providing a full supply of water to the bottom rows of tubes first. The flow is in the right direction along the tubes—upward and onward. As the tubes nearer the fire play the larger part in steam generation, the correct mode of water supply is of great importance. The Spearing boiler claims to surpass other water-tube boilers in this connection, and it has been especially successful in the

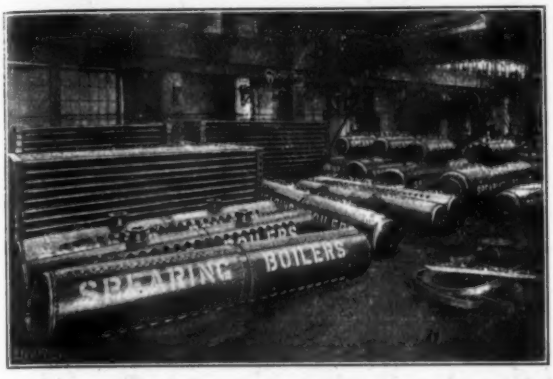



Fig. 3.—Spearing Boilers in Assembling Shop at the Hyde Works.

case of oil firing, the freedom from blistering of the tubes due to the positive supply of water to the bottom rows of tubes being very marked.

In the longitudinal drum type the headers are connected to the drum by curved nipples directly expanded into holes in the drum. These holes are compensated for by a doubling plate, thus avoiding the weakness of a cross-box with a large opening in the shell and a considerable flat surface.

One outstanding result of the general design of the Spearing boiler, with large downcomer pipes, large nipples, and straight headers, is that a free, natural, and positive circulation is secured. This feature, combined with the ample steam and water capacity, enables the boiler to respond readily to overload demands. The renewal and the cleaning of tubes are not only exceptionally simple, on account of the tubes being straight and easy of access, but the necessity for either is reduced by the peculiarities of circulation mentioned above. Expansion and contraction stresses are also minimised, as all parts liable to considerable changes in dimensions are free to adjust themselves.

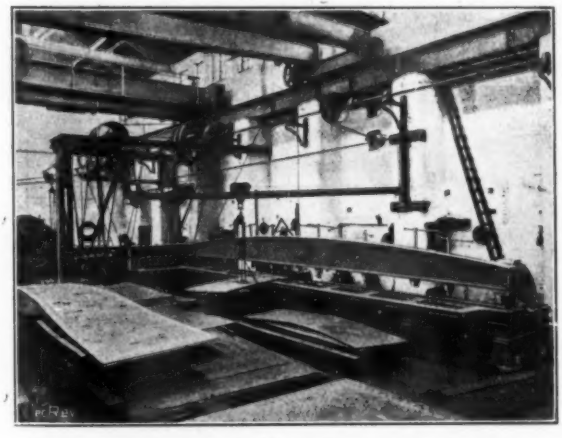


Fig. 4.—Large Planing Machine with Ending Device.

The factory, which is situated near Newton station on the Great Central Railway, contains machinery which can be directly adapted to the manufacture of Spearing boilers, and also possesses considerable room for additional plant. At present the capacity of the works is three boilers per week, and the developments immediately in sight will provide for an output of at least ten complete large boilers per week.

The first step in the process of manufacture is the planing of the flat plate on all edges. This is done on a 30-ft. planing machine fitted with an ending device which completes the ends at the same time as the sides. The plates are then bent into cylindrical form in bending rolls capable of taking plates up to 10 ft. in length and 1 in. in thickness. These rolls will shortly be supplemented by an hydraulic upsetting press, by means of which the edges of the plates will be pressed into the true cylindrical form.

The company is also about to install new large electrically-driven plate-bending rolls made by Messrs. John Musgrave & Sons, Ltd., for bending plates up to 20 ft. in length and $1\frac{1}{4}$ in. in thickness. The rolls are fitted with a hinged bearing, to allow of the cylinder being easily withdrawn from the top roller. The bottom rolls are driven by a 75-b.h.p. electric motor through steel gearing, and the adjustment of the top roller is effected by means of a 20-b.h.p. electric motor. The total weight of the machine will be 75 or 80 tons.

All holes are solid drilled right through; and after the drilling operation is completed the whole drum is taken apart and the holes are cleaned to take away all the swarf between the plates, so as to ensure the perfect fit of the butt strap plates and ends. Where possible, the riveting is done by means of an hydraulic riveting

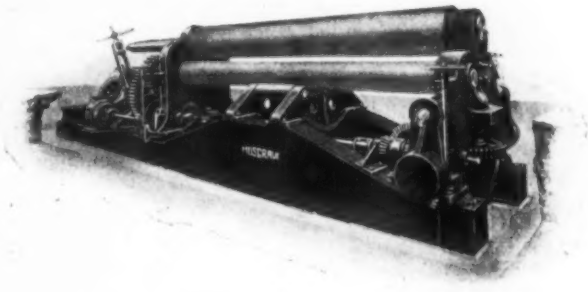


Fig. 5.—Electrically-driven Bending Rolls.

machine capable of exerting pressure up to 150 tons. In other cases the work is done by hand or by means of pneumatic riveters. After the riveting is completed, the edges of all plates are fullered by pneumatic tools to ensure a tight fit.

After hydraulic testing to double the working pressure, the holes required for connecting up to the headers are drilled by means of a special trepanning machine. Three of these machines are already installed, and in the near future the equipment will be increased to nine.

The headers are solid-drawn from mild steel, and, except in the boilers for the lowest pressure, they are all fitted with internal caps. In assembling the tubes into the headers, the end of each tube is placed in position and is expanded until it makes close contact with the circumference of the hole in the header. The ends of the tubes are then bell-mouthed by means of a pneumatic tool, so that any tendency for the tube to draw out is efficiently checked.

Each section of tubes and headers is completed by itself, the final process being the fitting of the caps. All the caps are internal, and, owing to the smooth surface obtained by the solid drawing of the header, it has been found unnecessary to machine the header in order to obtain efficient contact between the cap and the base. This permits of a very rapid assembling, after which each section is hydraulically tested up to double the working pressure.

Following the testing of the tubes and headers, the various parts are assembled and, after inspection, are taken down for transport.

The fitting shop, where all the small component parts, stand-pipes, tubes, &c., are drilled, is equipped with machines for planing and shaping the sides of butt straps, saws for sawing the tubes, and screwing and tapping machines for the headers.

All Spearing boilers are fitted with Ferguson patent sectional superheaters, which have been thoroughly tested on all types of boilers for many years. The chief feature of the Ferguson superheater is the ease with which sections can be removed without disturbing other sections or steam-pipe connections. Each section consists of a U-shaped tube terminating in flanges which are bolted to the headers. When a section is removed, blank flanges can be placed on the openings so that the superheater as a whole can continue working.

The weight of each section is about 120 lb., so that there is no necessity to use expensive lifting tackle in effecting repairs or replacements. The joints, which are out of the path of the flue gases, can be examined while the boiler is working. The amount of superheat obtained can be varied by increasing or decreasing the number of sections. It is claimed that on the average the use of the Ferguson sectional superheater reduces the coal bill from 10 to 20 per cent.

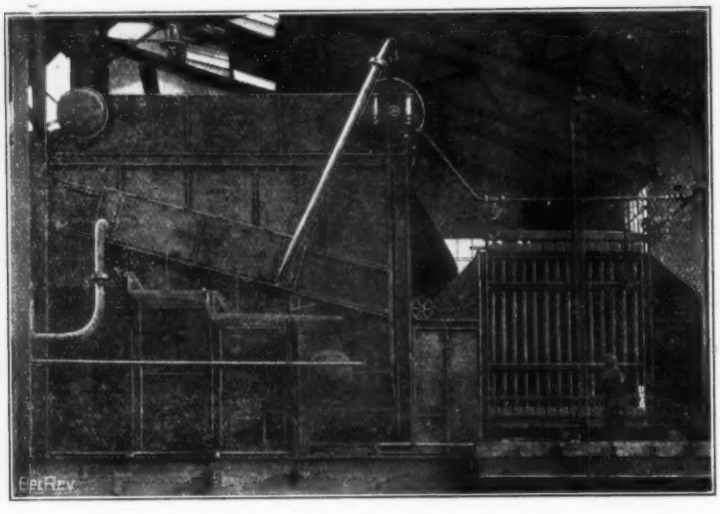


Fig. 6.—Spearing 25,000-lb. Boiler with Economiser, at Peterborough Electricity Works (four being installed).

Among the other developments arranged for by the Spearing Boiler Co. is the manufacture of all the structural and chimney work required for boiler installations. A large punching and shearing machine with an attachment for cutting angles has been installed for this purpose. A joiners' shop is at present being added to the factory.

## ELECTRICITY ON THE FARM: A MODEST EXAMPLE.

By F. R. CRIPPS.

In his recent paper, Mr. Borlase Matthews has dealt comprehensively with the application of electricity as a stimulant for every herb, fowl, and beast to be found on a farm. There is, however, just one *genus* which he has somewhat neglected, for the reason that, though found on every other farm, it is missing from that of Mr. Matthews. I refer to *homo* more-or-less *sapiens* in the person of the farmer. Before we can deal with the farm, we have to deal with the farmer, and it is pretty certain that the vast majority of the 418,000 farms mentioned could only be electrified over the dead bodies of their owners or tenants.

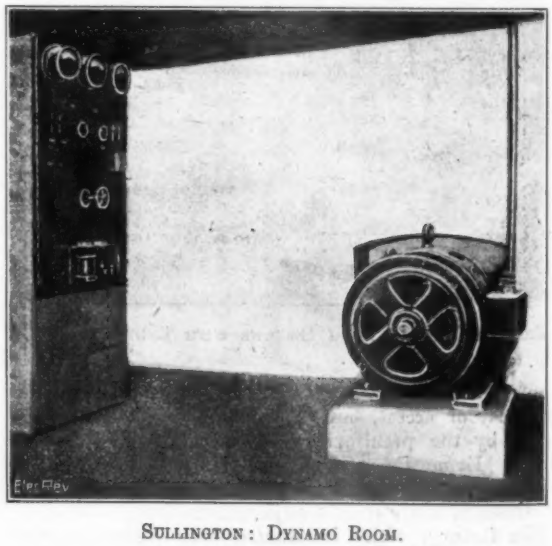
Fortunately, a certain proportion of these 418,000 farms have natural sources of power, and a certain proportion of farmers are not die-hards. It remains, therefore, as a first step, only to discover where these

Sullington: The Mill Pond, Mill, and Overhead Line.

two advantages coincide to be able to get to work. Such a place is Sullington, Sussex, with its mixed farm of over 1,000 acres, and such a farmer is the owner, Mr. A. G. Hecks, of the Manor House.

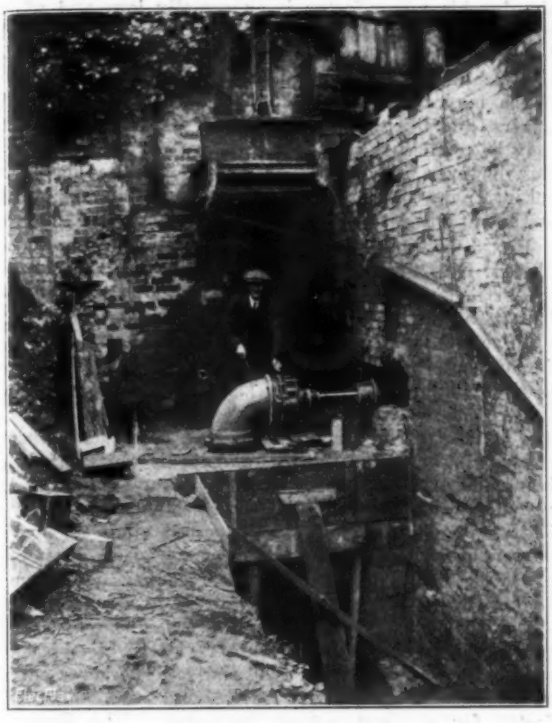
The natural source of power is the River Stor, a tiny stream that issues from the north side of the South Downs, a short distance away, and fills a pond of 1.3 acres, in escaping from which it used to turn an overshot waterwheel of 12 ft. diameter, and so ground the corn of generations of farmers. As the corn had been otherwise ground for many years, it was decided to use the water to reduce, as far as possible, an oil fuel bill which, during the war, exceeded £500 per annum.

By clearing the tail-race it was found possible to obtain a total head of 18 ft., and after due consideration it was decided to replace the old waterwheel by a 10-h.p. turbine of the open-flume, horizontal-shaft type, direct-coupled to a 6.25-kW generator with a voltage of 250-350 volts. This plant was supplied by the English Electric Co., and, together with a switchboard by Messrs. Robinson & Hands, was erected and connected entirely by unskilled farm labour, with some assistance from the village builder in the construction of the reinforced concrete turbine pit.



Sullington: Dynamo Room.

The farm is situated 1,000 yards from the mill, and the power is transmitted by a pair of 19/18 bare copper conductors supported on 16 poles. The insulators are of Messrs. De La Rue's unbreakable variety, fixed directly to the poles by swan-neck bolts. The power and telephone lines were completely erected by farm labour. In fact, the only skilled man employed was a wireman to wire the buildings.

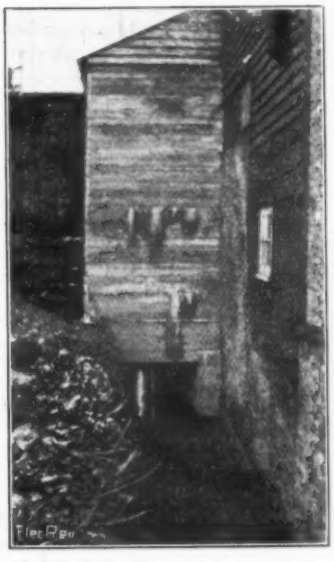


Erecting the Turbine.
The Old Mill Sluice and Site of Wheel are shown.

At the farm a 6-h.p. G.E.C. motor drives the main shaft formerly turned by an 8-h.p. Petter oil engine, now 21 years old, but as lively as ever. From this shaft are driven a root cleaner and chopper, a circular saw, a corn mill, a chaff-cutter, and a Lister vacuum pump for milking six cows at a time. This last absorbs 1.75 kW, and it is interesting to note that when the electric drive was initiated it was speedily discovered that the main shaft alone was wasting more power than was required to saw up trees a foot thick!

Owing to the high price of batteries and the low price of milk, Mr. Hecks decided to dispense with the luxury of an accumulator until next autumn. However, light for the house, farm buildings, and adjacent parish church, was required for the winter evenings, and something had to be devised. In the end it was arranged to have 13 cells of the battery at the farm end of the line, and to charge them in series with the 6-h.p. motor, a change-over switch cutting them out when necessary.

During the recent lambing season it was proved well worth while to run a temporary overhead line of a pair of 1/9 aluminium wires a distance of 500 yards to the pen, and many a young lamb owes its acquaintance with Mary, not to say mint sauce, to the fact that it was born under a lucky star in the shape of a half-watt lamp.



Completed Turbine Pit, showing Draft Tube and Tail Race.

One of the Poles.
The Line Runs Straight Across Country.

Thus is seen the apparent anachronism of electric milking in a barn that was there in Cromwell's time, and electric light in a Norman church surrounded by yew trees, from which former Sullingtonians cut the long-bows with which they resisted the last invasion of our shores.

## THE LOAD POWER-FACTOR AND ITS MEASUREMENT.

### SOME EVERETT, EDGCUMBE INSTRUMENTS.

Probably no question, at the present time, is receiving more attention, not only in this country, but also in America and on the Continent, than that of the effect of reduced power factor upon the cost of electrical energy.

It is recognised that the cost at which such energy can be supplied depends principally upon two factors, which may be called the "running cost" and the "capital cost." That both these factors, but particularly the latter, are affected by power-factor, will be apparent from the following considerations.

Referring to fig. 1, and assuming for the sake of simplicity a single-phase system, the horizontal line represents the kilowatts generated, $\phi$ the angle of phase displacement between current and voltage (almost invariably a lag), and the sloping line represents the volt-amperes which have to be supplied at a power factor of cos $\phi$ (0.7 in the case illustrated). It is clear that if the power factor is unity (*i.e.*, if cos $\phi = 1$ or $\phi = 0$), the volt-amperes and the watts are equal to one another, whilst at all other power-factors the volt-amperes are greater than the watts.

It will be seen from fig. 1 that the VA are actually made up of two components at right angles, known respectively as the "active component" (horizontal) and the "reactive component" (vertical).

The active component, which is equal to the watts, is made up of the product of the voltage into that component of the current which is in phase with the volts, whilst the reactive component is equal to the product of the voltage into that component of the current, which is 90° out of phase with it. The current and voltage in the latter case being 90° out of phase with one another, transmit no power, so that the reactive component is often spoken of as the "wattless" or "idle" component, or even as the "wattless power," although the latter appears to be a contradiction in terms.

Fig. 2 shows, graphically, the relationship between power-factor and VA, for a fixed power output at the station. The VA output is expressed as a percentage

of that corresponding to unity power-factor. It will be seen that at a power-factor of 0.7 the VA output is more than 40 per cent. greater than that at unity. This means that all electrical plant has to be installed for an output 40 per cent. greater than that which would be necessary were the power-factor unity, since the output of generators or transformers and the carrying capacity of cables depend upon the volt-amperes rather than upon the watts. As a result, the capital cost of the electrical plant is greatly increased—in fact, at a power factor of 0.5 it is almost doubled. In this respect it will be seen that a low *power-factor* is much the same in its bearing upon the capital cost of the electrical plant as a correspondingly low *load-factor*.

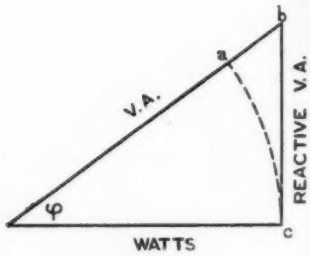


Fig. 1.

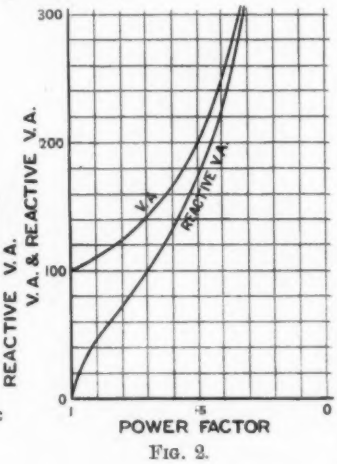


Fig. 2.

The influence on the generating and distributing costs is not so marked, but that it is serious will be evident when it is remembered that the copper losses of the conductors (generators, transformers, cables, &c.) are proportional to the square of the current and are consequently more than doubled when the power-factor falls to 0.7.

In view of the fact that the power-factor depends upon the nature of the load, and is therefore beyond the control of the power-station authorities, it is clearly good policy to give the consumer every inducement to improve his power-factor. To this end, a number of tariffs have been devised under which he is penalised or rewarded according to his average power-factor or, in some systems, according to his maximum demand in VA or in re-active VA. For example, under one arrangement a power-factor of, say, 0.8 may be taken as a datum, and if the average power-factor for the quarter exceeds this the consumer becomes entitled to a bonus, but if it falls below that figure he is either subjected to an increased charge or, as is more usual, the supply authorities try to bring pressure to bear upon him to improve his power-factor.

Fig. 3.—Portable Graphic Power-factor Meter.

We are not now concerned, however, with the actual tariffs so much as with the measurement of the power-factor, whether for the purpose of assessing a consumer's load with a view to fixing a rate, or to determine which consumers are the chief offenders in reducing the power-factor of the station load.

It has been found that, in many cases, the consumer is entirely unaware of the fact that at certain times of the day his power-factor is abnormally low, and when once the importance of this matter has been brought home to him he is generally quite ready to consider with the technical staff of the supply authority the steps which may be necessary for remedying this state of affairs, and this even in those cases in which his pocket may be unaffected by an improved power-factor. Unless, however, the consumer can be shown what has been taking place by an actual graphic record, no amount of argument will, as a rule, convince him.

Fig. 3 shows a portable graphic power-factor meter of Messrs. Everett, Edgcumbe's "Inkwell" pattern, which is particularly suitable for this purpose, in that it can be left entirely unattended for a week or more at a time.

In some cases it is desirable to record, not the power-factor, but the reactive VA, namely, the vertical side of the triangle shown in fig. 1. At unity power-factor the reactive component of the volt-amperes is zero, and it is often found to appeal to a consumer without electrical knowledge if this quantity is represented as being the extra current which the power-station has to provide owing to the low power-factor of his plant. This statement is not strictly correct, since the extra current demanded is represented by *a b* in fig. 1, and is always less than *c b*, the reactive component of the current. On the other hand, it is easy to show the consumer that at unity power-factor the current *c b* becomes zero, and that it should therefore be his object to reduce it to a minimum at all times. The lower curve in fig. 2 shows how the reactive VA vary with the power-factor for a given output in watts. The Everett-Edgcumbe graphic reactive VA meter for a three-phase system is very similar in appearance to the graphic power-factor meter shown in fig. 3.

A demand likewise arose for a graphic VA meter, but, for a long time, the difficulties of construction were so great that none was forthcoming. It might at first sight appear to be a comparatively simple problem to design such an instrument, but a little consideration will show that every possible arrangement in which the deflecting force is made dependent upon the product of volts and amperes is also dependent upon the phase displacement between them, and the effect of the latter factor is extremely difficult to eliminate. Messrs. Everett, Edgcumbe & Co., by means of a special phase-shifting device, have now produced a graphic VA meter similar in appearance to fig. 3, in which the effect of the phase-angle between volts and amperes has, for all practical purposes, been eliminated.

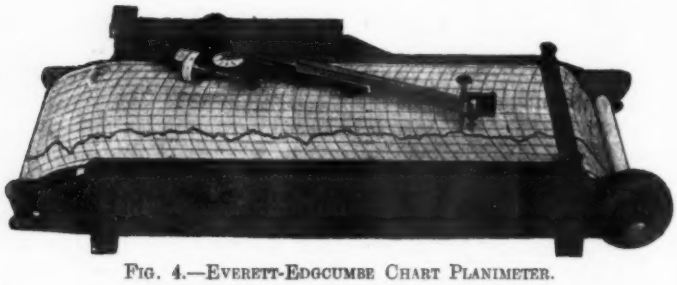


Fig. 4.—Everett-Edgcumbe Chart Planimeter.

It may be remarked, in passing, that if a VA meter is not available, the VA can always be calculated from a knowledge of the reactive VA and the kilowatts, since $VA = \sqrt{[\text{watts}^2 + (\text{reactive VA})^2]}$, as will be evident from fig. 1.

Having obtained a graphic record of the power-factor or VA over, say, a week, it is often desired to obtain

the average value thereof. This is ordinarily a very laborious process, entailing either the summation of a very large number of readings scaled off the chart or the measurement of the area by means of a planimeter. The latter method involves the division of the record into a number of small pieces, measuring the area of each, adding them together and dividing their sum by the length of the chart—altogether a very tedious process.

All this is obviated by the use of the Everett-Edgcumbe chart planimeter, shown in fig. 4. This consists of a metal framework, at one end of which provision is made for the reception of the roll of chart, as it is taken from the grapher, and at the other is a roller provided with a milled knob, by means of which the chart can be wound on to it. The chart passes over an accurately machined surface on which rests a special planimeter running in a groove. To determine the average value from the curve, the planimeter scale is set to zero, and the chart is slowly transferred from the left-hand roller to the right hand, the pointer of the planimeter being, meanwhile, kept on the record line. After the chart has been transferred, in this way,

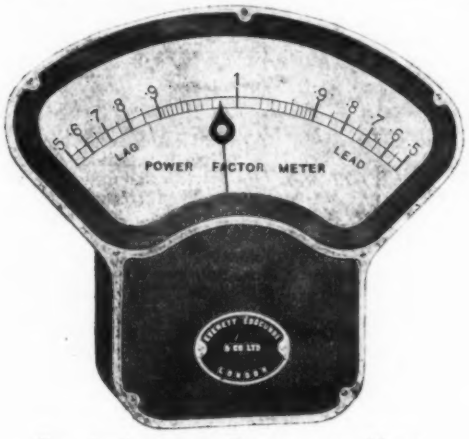



Fig. 5.—Indicating Power-factor Meter.

from the one roller to the other, the planimeter reading is taken and this figure, divided by the length of chart which has been passed under it, gives the average value of the power-factor or other quantity, over the period.

In the case of a graphic record of VA or reactive VA, it is more than likely that the total quantity delivered during the period may be required, rather than the average value. The total can be read off the planimeter direct, by proceeding as described above, except that it is unnecessary to divide by the length of chart.

So far, only graphic instruments have been considered, but for many purposes indicating power-factor meters, VA meters or reactive VA meters are of great value. They have proved most useful, for example, as a means of educating the consumer's engineer. If he has one of these instruments on the switchboard by the side of his ammeters and voltmeters he will have the question of power-factor brought forcibly to his notice, and it is found that in a large number of cases this alone produces very beneficial results, in that it leads to the switching-out of unloaded transformers or motors, and so forth. In those cases in which synchronous motors or other means of rectifying the power-factor are available, such an indicating power-factor meter or reactive VA meter is, of course, a necessity. Fig. 5 shows one of the large sector pattern, having a scale 12 in. long.

**Austrian Installation Firms.** — Under the style of Vereinigung der Elektro-technischen Installations-Industrie Osterreichs has lately been formed a society for the protection of the economic interests of the bigger installation firms in Austria. The scope of the society's operations is limited to those exclusively engaged in electrotechnical installations. The secretary is Engineer Emil Futter.

## PARLIAMENTARY NOTES.

(From Our Parliamentary Reporter.)

*Postal Rates Reduction and Wireless Telephony.*—Mr. Kellaway, Postmaster-General, in introducing the Post Office estimates, detailed the changes in postal rates and arrangements:—For letters not exceeding 1 oz., 2d. to 1½d.; postcards, 1½d. to 1d.; printed papers, 1d. to ½d.; and the restoration of Sunday collections. The new rates would, he said, come into operation on May 29th. Dealing with the telephone service, he said that the number of subscribers had increased by 16,691, and on March 31st was 995,242. The total number of new subscribers was 75,500, and the number of cessations was 64,000, of which 29,000 were due to the increased tariff. During the year 530 rural call offices had been opened at post offices, and 3,290 had been opened on rural party lines. In submitting proposals for the reduction of telephone charges, he did not propose to proceed on the principle recommended by the Select Committee, of an all-round percentage reduction. Such a reduction of 8 per cent., which was the utmost that he could make with a surplus of £1,200,000 on the telephone account, would be of very small benefit to the great majority of telephone users. He proposed reductions which would cost in a full year £1,100,000. These were a reduction of telephone rental of £1 10s. a year to users, making the rental in London £7; in Birmingham, Liverpool, Glasgow, and Manchester, £6 10s.; and in the rest of the country £6. He followed the Select Committee's recommendation in making the charge to private users less than the charge for telephones used for business purposes. The cost of this concession would be £200,000 in a full year, and £160,000 this year. The next reduction, which would apply to all users, was a reduction of the local message fee from 1½d. to 1¼d., costing £440,000 in a full year, and £350,000 this year. He proposed a reduction in the extra mileage charge on private wires and at terminals from £10 to £8, costing £142,000 in a full year, and £120,000 this year. The principal proposal with regard to trunk calls was that there should be a substantially cheaper rate for calls between 2 p.m. and 7 p.m. The average reduction of the rate would be 25 per cent. He proposed to abolish the local fee on all trunk calls over 1s. 6d. in amount, and to make modifications below that charge.

After outlining proposals for rural areas, Mr. Kellaway said that he was unable to adopt the recommendation of the Select Committee on Telephones, that the telegraphs and telephones should be united and the united service completely separated from the mails on the ground that it would not only make for confusion and inefficiency, but would also be extremely expensive. Turning to the question of the broadcasting of wireless messages, or radio-telephone broadcasting, he said that the system had a great vogue in the United States, and he had received a report showing that there were 750,000 of these receiving stations open in the United States. There had also been a considerable increase in the United States in the number of transmitting stations, and the result of this increase had been chaos. Mr. Hoover, the Minister of the American Government, under whose charge this work came, had recently appointed a committee to propose legislation to correct the chaos brought about by the unregulated erection of transmitting stations. We, fortunately, had avoided that difficulty. Proposals had come to him from several quarters for permission to open transmitting stations in this country. He had referred these proposals to the Wireless Sub-Committee of the Imperial Communications Committee, presided over by Sir Henry Norman, and it had made recommendations which he had adopted. He had decided to allow the establishment of a limited number of radio-telephone broadcasting stations. The country would be divided, roughly, into areas centring on London Cardiff, Plymouth, Birmingham, Manchester, Newcastle, Glasgow or Edinburgh, but not both, and Aberdeen, and one or more broadcasting stations would be allowed in each of those areas. Permission for these stations would only be granted to British firms which were *bona-fide* manufacturers of wireless apparatus. It was impossible, and it would not be in the interests of wireless telephony to grant all the applications that had been made to him for the right of transmission. He was asking the various firms which had applied to come together at the Post Office and co-operate, so that an efficient service might be rendered, that there might be no danger of monopoly, and that each service should not interfere with the efficient working of the other. The stations would be limited to a power of 1½ kilowatts, and furnished with wave lengths which should not interfere with other services. The normal hours for broadcasting would be from 5 p.m. to 11 p.m., except on Sundays, when there would be no limit. There would be certain regulations with regard to the character and class of news which these agencies would be allowed to transmit, but on that head he had not yet come to a decision.

He also proposed that the facilities for obtaining permits for the reception of these messages should be greatly simplified, and in future it would be possible for anyone desiring to install a receiving station to go to any post office and receive a permit for 10s., in the way they could obtain any other licence. The possibilities of this service were almost unlimited. In the

United States it was suggested that some arrangement might be made by which speeches of members of Congress might be radiated, and he could foresee a time when, perhaps on the table of that House, a receiver would be properly concealed so as not to jar the æsthetic senses of members, and their eloquence would be transmitted to those of their constituents who were prepared to pay the cost!

*Grampian Electricity Supply.*—This Bill came before a House of Commons Select Committee on May 2nd. Mr. W. E. Tyldesley Jones, K.C., who appeared for the promoters of the Bill, said that the measure was of very great importance. The proposals of the Bill were to incorporate a statutory company, to be called the Grampian Electricity Supply Co., and to empower that company to construct works in the neighbourhood of the Grampians for the purpose of harnessing the very large amount of water-power which was to-day running to waste, and by means of that water-power to work generating stations for generating electricity which could be used for commercial, industrial, and domestic purposes in a large part of Scotland. There were no very large supplies of water for generating electricity in England; it was in North Wales and Scotland that it was found possible to utilise on a large scale water-power for the generation of energy. To some extent already that power had been made use of. An Aluminium Co. was utilising it in North Wales, and such a company was also doing the same in Scotland, a little to the west of the position of the present scheme. A scheme for harnessing the water-power of the country had been reported on favourably on four occasions by Departmental Committees.

Replying to the Chairman, Mr. Tyldesley Jones said that the present position was that the very large area of supply offered great possibilities, because there was Dundee, a large seaboard, and plenty of land on which factories could be erected.

The promoters of the Bill claimed that with the power of harnessing the water supply of the Grampians they would be able to bring about a congregation in the area of supply of enormous industries which would utilise that power. They would also make available for the use of towns in the area energy which, in many cases, was developed now by means of steam power plant or which, in other cases, they had not got at all. That power would be utilised in some cases at considerable distance from the generating station. The scheme was one initiated by private enterprise, to be assisted, it was hoped, by a State guarantee. The scheme would do for a large part of Scotland what cheap coal had done for other parts of that country and for England. The scheme could be developed at any stage. They could complete one part of it by constructing one generating station at a time. They could lead up to the development of the whole scheme by easy stages. Negotiations were proceeding between the promoters of the Bill and the Board of Trade with a view to inserting a clause in the Bill by which the State could have the right on agreed terms and conditions to take over the undertakings by a certain date if the occasion should arise.

The Hydro-Electric Development Co. were the promoters of the scheme, and were promoting the Bill. The company comprised the British Italian Corporation, Ltd., the British Trade Corporation, the London, County and Westminster and Parr's Bank, Messrs. Wallace Brothers & Co., the British Steamship Investment Trust, and other authorised shareholders were Sir H. Babington Smith, Mr. Austen Harris, Mr. Ernest Cox, and Mr. Manzie Fe. The scheme proposed to use Lochs Ericht, Rannoch, and Garry, the River Garry, Loch An-Tseclich, Lochs An-Roin, Truim, Bruar, and Whaire. The catchment area was 417 square miles, and the waters to be utilised were capable of generating 56,000 h.p. continuously. By means of a dam at each end of Loch Ericht it was proposed to raise the level of the loch by 37 ft., and they could draw the loch down 25 ft., thus giving a total variation of 58 ft. A certain amount of land would be submerged by this process. They proposed to strike a tunnel, which would bring the water down to a power station at Loch Rannoch, which would be capable of generating 26,900 h.p. By means of conduits water would be brought into Ericht from various small lochs, making the Ericht a huge reservoir for the collection of those waters. Other power stations would be set up on the Bruar River, which should produce 4,200 h.p.; on the Garry River, 7,500 h.p., and near the tunnel, 17,400. In every case the promoters were willing to pay for every pennyworth of injury done. When the Bill was deposited there were 31 petitions. There were only three—those of three landowners—left now. A petition from Dundee had been withdrawn, and they had agreed not to enter into any competition in Dundee, except with regard to a supply for railway trains. They could not supply, to any undertaking in Dundee without the Council's consent. The whole scheme would cost 4½ millions, inclusive of the works, but meantime authority was sought to raise only one million pounds. In the ordinary course they could only borrow a sum equal to a half of their authorised capital, but in this case they were seeking for power to borrow 2½ millions. They hoped that the Credit Facilities Advisory Committee would guarantee the interest on their debenture stock. This could be done without any cost to the State.

The Committee adjourned until May 3rd.

On May 3rd, it was stated that an agreement had been reached between the promoters and one of the objectors, Mrs. la Terriére, of Dunalastair. Much evidence of a technical character was given, in the course of which it was stated that at the completion of the first stage of the scheme, with a scale of 170,000,000 units per annum, the cost per unit would be .3996d., but the price to be charged to the consumers would, of course, be higher, because of other charges, which must be taken into account. Excluding Edinburgh and Glasgow, which were special cases, the cost of production under the scheme would be distinctly lower than under any of the existing steam electricity stations, if capital costs were included.

Further evidence was heard on Thursday, and the Committee adjourned until Tuesday, May 9th, when the Bill was passed by the Committee.

*Nottinghamshire and Derbyshire Tramways.*—This Bill was considered by the Unopposed Bills Committee of the House of Commons on May 3rd. It was stated that the Bill sought powers for the construction of additional tramways intended to link up the main system of the company to the Ilkeston Tramways. After formal evidence the Bill was passed for third reading.

*Ayr Burghs Tramways.*—MR. MUNRO, Secretary for Scotland, has introduced into the House of Commons a Bill, which has been read a first time, to confirm a Provisional Order under The Private Legislation Procedure (Scotland) Act, 1899, relating to Ayr Burghs (Tramways, &c.), to be proceeded with under Sections 8 and 9 of the Act.

*The Electricity Bill.*—The second reading of the Electricity (Supply) Bill in the House of Commons has been deferred until May 15th.

*Yorkshire Electric Power Bill.*—This Bill has been read a third time in the House of Lords, and a first time in the House of Commons.

*Electrification of Suburban Railway Lines.*—Mr. Malone asked the Parliamentary Secretary to the Ministry of Transport, whether a guarantee of £6,500,000 had been made to the South-Eastern & Chatham Railway Co., under the Trade Facilities Act, 1921, for the electrification of suburban lines; whether he was aware that districts radiating in a north-easterly and east-north-easterly direction from the City were provided with more inadequate train facilities than any other suburban locality; and whether, taking into consideration the large amount of unemployed labour power now available, he could consult with the Great Eastern Railway Co. with a view to putting into effect a scheme for the electrification of suburban lines.

Mr. NEAL said he was aware of the congestion at certain hours in the districts named, and he had been in consultation with the Great Eastern Railway and had informed them that the Trade Facilities Committee were prepared to consider an application from them for assistance in raising capital for electrification work, but he understood that they did not propose to make such an application.

In reply to questions by Mr. GILBERT, Mr. YOUNG said the definite terms of the loan guaranteed by the Government to the Underground Railway Companies had not yet been settled, and he, therefore, could not say whether or not one of the conditions would be that an annual sinking fund should be provided for the repayment of the loan, but in any case, the repayment would be an unconditional obligation of the companies. As regarded the last part of the question, no special conditions were imposed; but the companies were, of course, amenable to the existing provisions of the law in this respect. One of the results of the guarantee would be that the accommodation on the City & South London Railway would be very considerably improved, and the comfort of the travelling public thereby increased.

*Wireless for Aircraft.*—Mr. Malone asked the Secretary of State for Air, whether he was aware that the arrangements for communication by wireless telegraphy with aircraft flying on the London-Paris route were far from satisfactory, and that improvements in the wireless telegraphy facilities would considerably increase the efficiency of the route and minimise risks of accidents; and whether the Air Ministry was represented at the recent international wireless telegraph conference in Paris.

Capt. GUEST replied: The answer to the first part of the question is that I am satisfied that the arrangements made in England for communication by wireless telephony with aircraft flying on the London-Paris air route are complete and efficient, but I am aware that the wireless arrangements are not so satisfactory on the remainder of the route to Paris. The urgent necessity of arranging wireless facilities on the French part of the route has been recommended by us to the French authorities on several occasions, and it is understood that wireless stations have actually been established at St. Inglevert and Le Bourget, but, up to the present, these are not functioning satisfactorily. Within the last few days, in connection with the recent air collision in France, the Air Ministry has again approached the French authorities on this subject, and I hope that the difficulties will now be overcome by them, and the wireless stations put into working order. The answer to the last part of my hon. friend's question is in the affirmative. The Air Ministry representative was the head of the British delegation.

*Imports from Germany.*—Mr. Baldwin, President of the Board of Trade, informed Mr. Kiley that during the six months, ended March 31st, 1922, there were imported into the United Kingdom, from Germany, electrical goods and apparatus, electrical instruments (other than telegraphic and telephonic) to the value of £1,081; and electro-medical apparatus, X-ray tubes, wireless valves and vacuum tubes, to the value of £815. The quantity of domestic hollow-ware of aluminium imported into the United Kingdom during 1921, registered as consigned from Germany, was 659 tons, valued at £130,828.

*The Barking Scheme.*—Capt. Martin asked the Parliamentary Secretary to the Ministry of Transport, whether, in the interests of the unemployed in the East of London, and also in the interests of the pressing needs of prospective consumers in the district with regard to the question of the erection of the proposed electric generating station at Barking, he was now able to say whether the company's reply had been in the hands of the Commissioners since March 1st; and when the formal sanction of the Commissioners would be given.

Mr. Neal replied: I am informed by the Electricity Commissioners that they hope that it will be possible to issue the consent at an early date.

*Trains on the Underground.*—Mr. Leonard Lyle asked the Parliamentary Secretary to the Ministry of Transport if he could state the frequency with which trains were now run on the tube railway of London, in business hours; whether he was aware that, when the Select Committee on London Traffic reported, it was stated that trains were run with a frequency which reached the maximum capacity of the lines; and whether he was aware that it was now quite common for five minutes or more to elapse between any two trains on the tube railways, even during the peak hours.

Mr. Neal replied: The booked intervals between trains on the underground railways during peak-load hours vary from 1½ to 2¼ minutes, and any greater interval is abnormal and due to delay to an individual train. I have not been able to trace the statement mentioned in the second part of the question.

## CORRESPONDENCE.

***Letters received by us after 5 p.m. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.***

### An Anomaly.

The following should, I think, be placed on record in all electrical papers:—

The headquarters of the Electricity Commissioners is Gwydyr House, Whitehall, a board on the door announcing this fact. I was passing the place last Friday and first noticed that the lamp over the gate was fitted with an upright, incandescent gas mantle; further investigation resulted in finding two large cone-shaped candle or torch snuffers, one on each side of the gateway on the railings. Further, a notice is on the door stating that admittance can be obtained by ringing the bell, which is one of the old-fashioned brass knob, crank bells. The place was closed, but it would be interesting to know whether gas is used for lighting the interior, as it is for the outside lamp.

**William B. Clarke.**

Ponders End, *May 8th*, 1922.

[The "cobbler's wife" again.—Eds. Elec. Rev.]

### Prospects in the Argentine.

The following letter, which I have just received, may be of interest:

"I have this morning heard from my agents in the Argentine, and I am sorry to say that the news is by no means encouraging. Products of British manufacture are absolutely out of it against American, and, above all, German. The people there allow that British products are by far the best and last very much longer, but in spite of this the Germans have almost the entire trade, which, I think, is what you have heard from another source."

**Bernard Drake.**

London, *May 8th*, 1922.

### Domestic Electrical Appliances.

We feel that that section of the electrical industry which is in closest touch with the general public, *i.e.*, the electrical contractor and retailer, should be made aware of the endeavours that are being made in another industry to secure a portion, if not all, of the business to be done in the above.

The official organ of the retailers of sewing and washing machines and carpet sweepers is continually advising its readers to take up these lines.

The following passage is taken from the said journal, dated May 1st:—

"We will only add that the daily Press is creating a demand for sewing and washing machines and carpet cleaners, and that it is for the domestic washing trade to supply the demand and not leave it to the electrical trade."

Our own practice has, of course, been to treat with the legitimate electrical trader, but we think you should impress on your readers the great danger they are in of losing a good portion of what is proving a very lucrative and growing field.

**E. H. Morton,**
*Works Manager, Sun Electrical Co., Ltd.*

London, *May 6th*, 1922.

### The Lead Hydrate Battery.

I am informed by the makers of the above battery that after completely discharging it will give 90 per cent. of its rated capacity at any rate of discharge, after only 15 minutes' charging.

Perhaps someone will correct me, if I am wrong, but presumably a battery rated at, say, 100 ampere-hours at the 10-hour rate would at 100 per cent. efficiency require to be charged at no less than 360 amperes for 15 minutes!

Surely, this must be a wonderful battery.

**B. W. Gothard,**
*Chief Engineer.*

Electricity Works,
Farnborough, Hants.
*May 8th*, 1922.

## LEGAL.

J. Holbrook & Co. *v.* Court.

In the Mayor's and City of London Court, on Friday, before Judge Jackson, the hearing of a test case was resumed in which plaintiffs, electrical engineers, 1, Foster Lane, Cheapside, E.C., claimed £69 3s. against defendant, a purveyor of meat and fish dealer, Post Office Square, Whyteleafe, Surrey, for installing the electric light at his shop, &c. Mr. R. J. Sutcliffe appeared for the plaintiffs and Mr. Baker for the defendant. Mr. Sutcliffe said that the defence was that to induce the defendant to give the order plaintiffs' representative, Martin, warranted that they had made the necessary arrangements with the Electrical Supply Co. to put the cables in the road, and that they would be laid down within two or three weeks. Defendant gave the order on the faith of that representation, which, he said, plaintiffs' representative fraudulently or recklessly made, and he had lost the whole value of the work as the power had never been supplied. He counter-claimed for the sum claimed, and £10 damages for the misrepresentation. Plaintiffs' case was that defendant gave the order for installing the electric light and the work was done. Plaintiffs did not represent that the supply company would put in the mains either in two or three weeks or any definite time. Plaintiffs agreed to wire the defendant's fish depôt for £9 15s., the butcher's shop for £24, the refrigerator and sausage making machine, &c. The work was completed and plaintiffs did their best to get the supply company to extend its mains to the village, but that had not yet happened. That was no reason why they should not be paid their account. Defendant said that the plaintiffs' services were useless to him, as the supply was not yet in the village, because plaintiffs never got 15 customers as arranged. Plaintiffs said they did but that three backed out. The further hearing was adjourned last July, Judge Jackson suggesting that the plaintiffs' work might yet be very useful. Mr. Sutcliffe now said that the parties had not been able to arrive at a settlement. Martin, plaintiffs' representative, said that Howard, the former engineer to the Urban Electric Supply Co., told him if he could get 15 subscribers the cable would be laid. He got the 15 subscribers and then Howard said it would be done in two or three weeks. After that defendant gave him the order to do the wiring. James Smith, plaintiffs' chief electrician, confirmed Martin's evidence. Harry Bland, electrician to the plaintiffs, was also called. Edward Lewis, the present resident engineer for the Urban Electric Supply Co., said he hoped some day to get the electric mains through Whyteleafe. He would not do the work at present, because of the great outlay which would be required, but prices were dropping. For the defence, Mr. Court, the defendant, said that Martin distinctly told him that his neighbours were going in for electric light installatons instead of gas. He was more concerned about the power for driving his machinery and refrigerator than for the light. When he asked about the cables being laid, Martin told him that the Urban Supply Co. had made arrangements to have the cables laid. Nothing was said about the number of subscribers that would be wanted. He signed the application form only when he was told that the cable would be laid in two to three weeks.

Mr. S. Howard, engineer, Norbury, formerly the resident engineer to the Urban Electric Supply Co., said he told Martin he would lay the cable if 15 subscribers signed agreements, which were very different to promises, as he knew. That had never been done. He never promised Martin definitely that he would lay the mains in any particular time. Judge Jackson said the case was certainly important as there were others dependent upon it. He had come to the conclusion that there was misrepresentation, but not fraudulent. He need not go into the question whether there was any warranty or not, although he thought there was. He found for the plaintiffs for the amount claimed, without costs, but for the defendant for 50 guineas on the counter-claim, with costs.

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### Vokes *v.* Cardiff Corporation and the Salvation Army.

In this action, heard at Cardiff County Court last week, Mrs. Mary Elsie Vokes, of Canton, Cardiff, sued the joint defendants for £40 damages for personal injuries. On January 3rd plaintiff was pasing along Kingsway when something dropped in front of her, and on looking down she saw her left foot bleeding, having been cut by the falling glass of one of the lamps of an electric standard. She was taken into a hotel near by and a doctor summoned, two stitches being put into the wound. A gale was blowing at the time and the lamp was on a standard to which was attached a streamer banner put there by the Salvation Army, which was stretched across the road to a standard on the other side. For the Corporation it was submitted that the accident was due to the banner being strung so near the lamp that it caused the standard to vibrate more than it should have done, thus shaking out the glass. The banner had been put up by the Salvation Army without the permission of the police, and the Corporation therefore disclaimed liability. A point arose with regard to the anti-vibration device on the lamp, and in respect of this Donald Arthur Watson, a corporation lighting inspector, said that a definite indication as to whether the lamp guard was screwed too tightly was given by a rubber protector at the bottom of the lamp guard. The ball-joint, being rough-cast, had a sluggish movement, and the lamp would not swing more than two inches. The city electrical engineer (Mr. C. G. Morley New), said the ball-joint referred to was not a true ball-joint, but had a definite stop-point, and abnormal swinging would cause a jar which would bring about the fall.

Judge Hill Kelly, entering judgment for the Corporation with costs, and for plaintiff against the Salvation Army for £25 with costs, said that the anti-vibration device of the ball-joint was made insufficient through the additional vibration created by the wind acting on the banner.

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### C.T.S. *v.* Rats.

As a result of the advertisement "C.T.S. *v.* Rats," of the St. Helens Cable & Rubber Co., Ltd., Warrington, in the Electrical Review, of April 14th, the R.S.P.C.A. offices were inundated with letters, and at Warrington Police Court on Thursday (May 4th), Mr. J. H. C. Brooking, the Cable Company's general manager, was fined £5, and two guineas costs, for cruelty to the rat by not providing it with sufficient nourishment. The magistrates were Mr. J. H. Smethurst (chairman), Dr. Naden, and Mr. J. E. Richardson.

Mr. T. S. Steel appeared for the defendant.

Mr. F. A. Lewis prosecuting on behalf of the R.S.P.C.A., said the circumstances in the case disclosed a particularly callous indifference to the suffering of an animal. Apparently complaints had been received that rats had been gnawing through the firm's cable. In order that they might test the rumour or accusation, they hit upon the fiendish device of catching a rat on Sunday morning, March 13th, and putting it in a cage with three pieces of cable which they smeared with essence of aniseed, to entice the rat, and they handled the cable with gloves so that the rat could not smell human fingers. The rat was kept in the cage with three pieces of "succulent" rubber for four days. They watered it each day, and on the second or third day a small piece of bread was put into the cage and the rat ate it ravenously. On the Thursday night the creature died, and the firm promptly proceeded to advertise the fact in the Electrical Review. If the firm thought they were going to achieve an advertisement by that means they succeeded beyond their expectations, because at once the R.S.P.C.A. was inundated with letters from hard-headed business men.

Mr. Steel: You can only state what can be given in evidence.

The Clerk: Keep to the facts.

Mr. Lewis said that the following week two letters appeared in the Electrical Review.

Mr. Steel: Again, I object.

The Clerk again ruled in favour of Mr. Steel, and Mr. Lewis continuing, said that on April 24th Mr. Brooking was seen by Inspector Dee, and at the time had the advertisement before him. He said "I am entirely responsible for this thing," and added that he was conducting a scientific experiment, and did not think he was committing cruelty at all. "I ask you," concluded Mr. Lewis, "to inflict such a penalty as will stop an experiment of this nature, which, after all, is only a trade gain and cannot advance science in any way whatever. It is simply put into the paper for financial gain and nothing else."

Mr. Steel said he was prepared to admit there had been a technical offence, within the meaning of the Act. Mr. Brooking claimed, on behalf of his invention, that rats would not attack the sheathing, and that it might be relied upon and did not require, as most cables did, an iron casing. Inquiries were made from time to time by customers regarding the sheathing and despite the fact that various experiments were tried—a piece of sheathing was left lying about the works where there were a number of rats, but it was not attacked—it was not enough for customers, who said they had no proof. Another attempt was made by putting a piece of sheathing across the rat hole, and he (Mr. Steel), had a piece in his possession which was across a rat run for over two months, and there was not a mark on it. Even that, however, was not sufficient to satisfy customers.

Mr. Lewis: If we are to keep to facts, we must keep to them. I hope he is not getting another gratuitous advertisement.

Mr. Steel: I am not doing that consciously.

Continuing, Mr. Steel said that being desirous of demonstrating the fact that the sheathing was impervious to rats, Mr. Brooking thought it would be better to try it with a rat, and it was done as a scientific experiment. There was no intention to be cruel, as was proved by the fact that water was supplied twice each day, and on one occasion it was fed with a piece of bread.

Mr. Lewis: A small piece of bread.

In reply to the Chairman, Mr. Brooking said if the insulation was exposed and gnawed there was a possibility of injury to the cable and of fires being caused. It was necessary to find out the effect of the proximity of rats. He would like to correct one of Mr. Steel's statements. He (Mr. Brooking) did not know for certain that the sheathing would withstand the rats. There had been much contradictory evidence, so that he thought it necessary to have the experiment made and the result published.

The Chairman of the bench asked Mr. Lewis, if a firm wished to expeirment in the interests of the community, whether it would not be possible to experiment or to obtain a licence which would enable them to do it.

Mr. Lewis said it was absolutely impossible. The firm would have to take the run of things and not inflict pain and suffering. They could not obtain a licence; the only licences were for vivisection, &c.

The bench retired, and on their return, the Chairman said the offence had been admitted, and they were satisfied that there had been cruelty according to the law. They could have inflicted a fine of £25 or sentence of three months' imprisonment, but they had no desire to do anything of the kind. Defendant would be fined £5.

On the application of Mr. Lewis, two guineas costs were allowed. He applied originally for three guineas.

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### A. Williams & Son v. Carlin Bros.

A claim for £40 damages for alleged breach of agreement was made at Preston County Court, on May 3rd, by plaintiffs, electrical engineers, against defendants, of James Street, Liverpool. It was stated that last November plaintiffs entered into an agreement with the defendants whereby plaintiffs were to supply a "Time-saver" washing machine, complete with an electric motor. There was also an agreement respecting an exchange of typewriters. The application was for £6 and £5 damages. The judge gave a verdict for this amount, defendants not being represented.

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### Kelly & Tarshis *v.* Alexandra Clothing Co.

In the Shoreditch County Court, on May 1st, before Judge Cluer, Messrs. Kelly & Tarshis, of Shoreditch, electrical engineers, sued the Alexandra Clothing Co., Bow, to recover £15 6s., the balance of an account for £70 6s. for electrical work carried out.

Mr. C. H. Coumbe was counsel for the plaintiffs, and the defendant appeared in person. Mr. Tarshis gave evidence, and said that he fitted the factory with electricity. He supplied a motor and starter for £25, and to prove that was the correct price, having had difficulty in getting his money on previous occasions, he asked for the money before supplying, and got it. As to a radiator, he denied that he had ever promised to take it back; the defendants had spoiled it themselves. They had laid it on its side, heated a kettle on it, the water had run over, causing "shorts" and the constant breaking of the wires. As to the electric lights in the office, it was true they went wrong, but that was due to a leaky roof and not bad work, as it had to be passed by the Borough Council and the insurance company. He put it right, sending two men to do it, and the price he had charged was so ridiculous that it would have paid him better to give the defendants £1 to stop away. In cross-examination, he denied that he agreed to send a 3-h.p. motor for £25, but only sent a 2-h.p. motor, which should have been £18. The defendants, however, said this was the fact, the price all along having been agreed at £18 for a 2 h.p. motor, which plaintiff declared he could not get hold of.

Finally, he said he could get a 3-h.p. motor for £25, to which defendant agreed, but he sent in a 2-h.p. machine after all. One of the radiators was intended for heating purposes, but there was no heat from it.

Judge Cluer eventually found for the plaintiffs for £3 16s. only, and judgment was entered accordingly, with costs.

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SOUTH STAFFORDSHIRE TRAMWAYS (LESSEES) CO., LTD. *v.* MAYOR, &C., OF WEST BROMWICH.

IN the Divisional Court of King's Bench on May 5th Mr. Justice Lush and Mr. Justice Greer heard a motion by the West Bromwich Corporation to set aside an award made by Sir Lynden Macassey in December last, sitting as arbitrator, on the ground that he had made declarations after his award which were beyond his jurisdiction.

MR. DISTURNAL, K.C., appearing for the Corporation, explained that the matter arose out of a lease granted by the Corporation to the Tramway Co. of the tramways within the Corporation area. The Corporation, under the lease, undertook to keep the tramways and the roadway adjoining in repair. There was a covenant by which the Tramway Co. agreed to contribute to the net cost, plus a certain percentage for overhead charges, of renewals, and the Tramway Co. undertook to pay annually to the Corporation the net cost of renewals of the track as distinguished from the adjoining road. From time to time the stipulations of the lease were varied, and in 1917 there was an agreement by which the amount to be expended by the Corporation and the amount to be contributed were cut down, and it was agreed that the Corporation should keep the tramway in the condition in which it had been during the war, and that the lessee company should contribute £1,500. The arbitration was as to whether or not the Corporation had performed its obligation in keeping the tramway in repair in accordance with the agreement.

The arbitrator, in his award, said the plaintiffs were not entitled to the damages which they claimed, but he awarded them 40s. nominal damages, for what he considered breaches of covenant by the Corporation, and that 40s. had been tendered to the plaintiffs in the course of the proceedings. The arbitrator said counsel had made a series of declarations for which one could not see the necessity, as the claim was merely one for damages. He, however, made a declaration in respect of matters which another arbitrator must take into consideration in determining what further sums the lessee company should pay by way of contribution to the Corporation in respect of repairs to the line.

MR. TYLDESLEY JONES, K.C., for the company, in reply to Mr. Justice Lush, agreed that the pleadings left the matter in doubt as to whether there had been any consent to enlarge the dispute, but he submitted that on the documents both parties left to the arbitrator the determination of what was the effect of previous breaches of covenant on subsequent liability.

MR. JUSTICE LUSH said it would be better to remit the matter to the arbitrator to expunge from the award so much of it as related to declarations of the future, leaving only the declarations as to the past. His Lordship added, in the course of his judgment, that he thought the arbitrator should have omitted from his award matters relating to future considerations. He had, however, made as part of his award certain declarations which laid down principles upon which future assessments would have to be made. If it was allowed to stand, it was clear that it would be binding upon the parties, and therefore binding upon any arbitrator who might be appointed in future disputes. He was of opinion that the arbitrator had no jurisdiction on such matters, and the award would have, therefore, to be remitted to him.

MR. JUSTICE GREER concurred.

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A CARDIFF CORPORATION CLAIM.

CARDIFF Corporation was awarded £11 10s. damages at the County Court last week against a local shipowner who drove his motor backwards for some distance along the wrong side of the street and broke down an electric fire alarm post.

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DAMAGES AGAINST PERTH CORPORATION.

THE *Dundee Advertiser* reports that damages amounting to £102 have been awarded to Mrs. Catherine Malloch, against the Perth Town Council, as compensation for injuries received in a tramway accident which occurred in August, 1920. The applicant stated that she was alighting at a stopping place when the conductor blew his whistle, the car started with a jerk, and plaintiff was thrown to the ground, sustaining injuries to her right shoulder, which incapacitated her for business. The Sheriff allowed the claim upon the ground that the Corporation was responsible for accidents caused by the negligence of its employés.

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# BUSINESS NOTES.

**Bankruptcy Proceedings.**—A. V. CLAYTON (Clayton Motors), engineer, Park Lane Mills, Leeds.—Receiving order made on April 29th on debtor's own petition.

SAMUEL HOLMES, trading as Holmes & Co., Palatine Chambers, Halifax, electrical contractor. The following are creditors:—

| | £ | | £ |
|---|---|---|---|
| Bateman, Stanley ... ... ... | 40 | Illingworth, W. H. ... ... | 30 |
| Bell, B., & Co. ... ... ... | 30 | Lazarus & Price ... ... ... | 46 |
| Halifax Office Supplies Co. ... | 11 | Lipton, B. ... ... ... ... | 45 |
| Halifax Corporation ... ... | 14 | Priestley, J. M. ... ... ... | 150 |
| Hartley, Ernest ... ... ... | 160 | Silekt Electrical Eng. Co. ... | 14 |
| Hartley, Percy ... ... ... | 30 | Wright Motors ... ... ... | 18 |
| Hoyle, Joshua ... ... ... | 23 | | |

HERBERT OLDFIELD, 51, Milton Terrace, High Street, Heckmondwike, late Silver Street, Stainforth, near Doncaster, electrical engineer, formerly a grocer and general dealer.—The public examination of this debtor was held recently at Dewsbury. According to the statement of affairs, there was a deficiency of £454. Debtor attributed his failure to loss by fire. He stated that when he went to Stainforth he had £500 capital and furniture valued at £400. A fire occurred on the Stainforth premises in February, 1921. The turnover had been about £10 weekly. After further questions the examination was closed.

WM. HENRY ROSLINGTON, lately trading as the Greenling Electric Supplies, 240, High Holborn, W.C.—The first meeting of creditors under this failure was held on May 5th at the London Bankruptcy Court. The Official Receiver reported that the debtor carried on business in partnership under the style of the Greenling Electric Supplies, into which as sleeping partner he put £100, his partner providing the experience. They each drew £10 a week from the business from December 1st, 1919, until the end of the following March. As the business needed further capital, his partner borrowed £300 on their joint promissory note from his (debtor's) father-in-law, and they raised a further £300 on security of their joint promissory note. The whole of the money so raised went into the business, in addition to which they obtained an overdraft from the bank of £250, which had since been reduced to £40. The partnership, which had been verbal, was dissolved by mutual consent in May, 1920, the debtor taking over the assets and liabilities of the business, although he had since ascertained that book debts of the face value of £1,000 were irrecoverable. He afterwards transferred the business to 240, High Holborn, and converted it into a limited company called Greenling Electric Supplies, Ltd., with a nominal capital of £5,000. As vendor he was allotted 1,000 ordinary shares in payment of stock and contracts, and he was appointed managing director of the company at a remuneration of £500 per annum plus director's fees £100 per annum. Preference shares to the extent of £1,000 were taken up for cash. The debtor had, however, resigned his directorship and transferred his holding in the company to another person. He attributed his failure to the long illness of his wife and heavy expenses thereof, and to the lack of trade. His statement of affairs showed liabilities £1,209 and assets nil. The estate was left in the hands of the Official Receiver.

FRANK RAWCLIFFE (trading as Frank Rawcliffe & Co.), 8, Nun Street, Newcastle-on-Tyne, electrical engineer.—The adjourned first meeting of the creditors was held recently at the Official Receiver's office, 4, Northumberland Street, Newcastle-on-Tyne. The statement of affairs showed liabilities of £3,866, against assets of £11. At the last meeting it was stated that debtor claimed that a company registered on August 15th, 1921, had taken over his business and agreed to pay the liabilities owing on April 16th, 1921, besides paying debtor £7,000 in shares and £3,500 in cash. Debtor stated that he had only received the shares. A resolution for voluntary liquidation was passed on January 30th last, and debtor said that under the liquidation he waived all claim to the £3,500 cash, to enable his creditors and the creditors of the company to be paid a dividend of 10s. in the £, to be secured by a debenture in a new company about to be formed. If the creditors approved of that arrangement and decided to treat the new company as their debtors there would be no liabilities in the present procedings, but if they objected the trustee would have to be advised with regard to the £3,500. After some discussion the meeting was further adjourned.

F. S. ORMONDE (carrying on business in co-partnership with another as The Soho Electrical Works), electrician, 125, Islington, Liverpool.—First meeting, May 11th. Public examination May 30th, at the Court House, Liverpool.

R. F. MAYNER, electrical engineer, Narrow and Wentworth Streets, Peterborough.—First meeting May 9th. Public examination June 9th, at the Law Courts, Peterborough.

W. CAMP (W. Camp & Co.), electrical engineer, Carr Lane, Slaithwaite, Huddersfield.—Last day for proofs for dividend, May 20th. Trustee: Mr. W. Durrance, Official Receiver, 12, Duke Street, Bradford.

D. C. BATE, electrical manufacturer and supplier, 16, John Dalton Street, Manchester.—First meeting, May 17th, at the Official Receiver's offices, Manchester; public examination, June 30th, at the Court House, Manchester.

**Company Liquidations.**—Watts, Williams & Co., Ltd., electrical engineers, Leysfield Road Works, Goldhawk Road, Shepherd's Bush, London, W.—The following are creditors herein:—

| | £ |
|---|---|
| Burt & Co. ... ... ... | 36 |
| Churchill (C) & Co. ... ... | 55 |
| Cook, Howard E. ... ... | 30 |
| Electric Auto Supplies ... | 27 |
| Engravers' Guild, Ltd. ... ... | 16 |
| Harman (J. F.) & Co. ... ... | 120 |
| Mayo (Frank) & Co. ... ... | 23 |
| Freeman, W. C. ... ... | 54 |
| Hermans, Ltd. ... ... ... | 68 |
| Gestetner, D., Ltd. ... ... | 75 |
| Morton, G. N., Ltd. ... ... | 10 |
| Howland Bros. ... ... ... | 12 |
| Graham (A.) & Co. ... ... | 20 |
| Hammersmith Borough Council | 169 |
| Harper, Bean & Son, Ltd. ... | 50 |
| Herbert Terry & Co., Ltd. ... | 479 |
| Hall (John) & Son (Bristol), Ltd. | 14 |
| Keen (W. B.) & Co. ... ... | 52 |
| King's Patent Agency, Ltd. ... | 21 |
| Lewis, S. H. ... ... ... | 300 |
| London Electric Wiring Co. ... | 26 |
| L.P.S. Electrical Co. ... ... | 26 |
| Middleton, J. R. ... ... ... | 538 |
| Morgan Crucible Co. ... ... | 68 |
| Bankers ... ... ... ... | 3,019 |
| New System Private Telephone Co. ... ... ... ... | 24 |
| Parsons & Sons ... ... ... | 24 |
| Raggett & Co. ... ... ... | 18 |
| Rigby (F. W.) & Co., Ltd. ... | 36 |
| Ripaults, Ltd. ... ... ... | 67 |
| Simmons, J. S. ... ... ... | 12 |
| Thorn & Hoddle Acetylene Co. | 36 |
| Universal Card Engraving Co. | 60 |
| Webb, W. & N. ... ... ... | 37 |
| Whittingham & Wilkins ... | 63 |
| Williams, Captain ... | 15,699 |

Anglo-Mexican Electric Co., Ltd.—Winding up voluntarily. Liquidator: Mr. R. R. Skelsey. Meeting of creditors May 17th, at 47, Parliament Street, S.W. Particulars to the liquidator by June 1st.

W. E. Blake, Ltd.—Meeting of creditors May 16th, at the offices of the liquidator, Mr. H. B. Everett, 3/7, Southampton Street, Strand, W.C.2, to whom particulars should be sent by June 4th.

Vactite Wire Co., Ltd.—Meeting of members called for June 7th, at 12, Grosvenor Gardens, S.W., to hear an account of the winding-up from the liquidator, Mr. L. J. Yeoman.

The Maxim Lamp Works, Ltd., 75, Canonbury Road, Highbury, N.—The creditors and shareholders of this company (in liquidation) met last week at the Carey Street offices of the Board of Trade, Lincoln's Inn, W.C. Mr. E. T. A. Phillips, Official Receiver, reported that the company was formed in March, 1910, with a nominal capital of £8,000, divided into 6,000 cumulative participating preference and 2,000 ordinary shares of £1 each; the whole of the shares had been issued. The object of the formation was to acquire the business carried on by the Receiver for the debenture holders of the Maxim Lamp Works Electrical Co., Ltd., of Shernall Street, Walthamstow. A statement of affairs showing the position as at the date of the appointment of the debenture holders' Receiver on July 28th, 1921, was presented, from which it appeared that the liabilities amounted to £11,050, of which £4,987 was expected to rank against assets valued at £3,579, and consisting of the estimated surplus from the fully-secured debts. After payment of the preferential claim, £77; and of the loans on debenture bonds, £3,000; there was shown a balance of £502 available for the unsecured creditors, who were accordingly faced with a deficiency of £4,485. Mr. Alfred Tosh was acting as the receiver for the debenture holders. The liquidation was left in the hands of the Official Receiver. Appended is a list of the chief creditors:—

| | £ |
|---|---|
| Glashutter-verks Auterbruten, Penzig ... ... ... ... | 112 |
| Bomkessel, P., Berlin ... ... | 85 |
| British and Northern Shipping Agency ... ... ... ... | 10 |
| Brightling (G. C.) & Co., Ltd. | 35 |
| Burton, A. E. ... ... ... | 30 |
| British Oxygen Co., Ltd. ... | 15 |
| Duram, Ltd. ... ... ... | 22 |
| Douglas, W., Ltd. ... ... | 36 |
| Davis (C. J.) & Co., Ltd. ... | 119 |
| Edison Swan Electric Co., Ltd. | 87 |
| Gunn Trading Co., Ltd. ... | 33 |
| General Electric Co., Ltd. ... | 240 |
| Good (H.) & Son, Ltd. ... ... | 12 |
| Hayes & Hayes ... ... ... | 14 |
| Imperial United Lamp Co. ... | 474 |
| Melin (C.) & Co. ... ... ... | 25 |
| Moncrieff, J., Ltd. ... ... | 13 |
| Phelps (E. B.) & Co. ... ... | 51 |
| Plowden & Thompson, Ltd. ... | 452 |
| Johnston (R.) & Co., Ltd. ... | 115 |
| Sloan Electrical Co. ... ... | 393 |
| Shercaton Glass Co., Ltd. ... | 367 |
| Stella Lamp Co., Ltd. ... ... | 43 |
| Scientific Metals Co., Ltd. ... | 528 |
| Tomey (F.) & Co., Ltd. ... ... | 261 |
| Troller, Goodall & Palleson ... | 401 |
| Vactite Wire Co., Ltd. ... ... | 26 |
| Wiggins (H.) & Co., Ltd. ... | 12 |
| Williamson, J., Ltd. ... ... | 71 |
| Walsh, Walsh J. ... ... ... | 169 |
| Z. Electric Lamp Supplies, Ltd. | 156 |
| Soacke (Z.) & Co., Dresden ... | 76 |
| Hatcher, F. ... ... ... | 93 |
| Poynter, J. F. ... ... ... | 71 |
| Gas Light & Coke Co. ... ... | 117 |
| *Islington Journal* ... ... ... | 90 |
| Fully secured ... ... ... | 2,274 |
| Preference ... ... ... ... | 77 |

Hubert D. Carter (Bangor), Ltd., electrical instrument dealers, High Street, Bangor.—At Bangor County Court, on Monday, Mr. Burgis, of Manchester, applied for a compulsory winding-up order in this case. Mr. Burgis said the company was formed in 1920 with a capital of £5,000. There was also another company, said Mr. Burgis, at Colwyn Bay, which was established in 1917 with a capital of £5,000. The Colwyn Bay Co. supplied electrical appliances to the Bangor firm; the two firms had the same secretary, the same directors, and the same auditors. He suggested that the two companies were so closely allied that there ought to be an independent investigation. Mr. Burgis represented Higgins, Ltd., Downes & Davies, Electrical Appliances, Ltd., the General Electric Co., Ltd., and another creditor with claims amounting to £360. Mr. Hooson, Official Receiver, said he had been appointed provisional liquidator, and the Judge eventually made an order for the voluntary winding-up of the estate, the official liquidators to be Messrs. Poppleton (Birmingham), and Eaves (Manchester), the costs of the petitioners, the Official Receiver, the provisional liquidator, and Messrs. Bone & Johnson to come out of the estate.

Swarren, Ltd.—First meeting of creditors and contributories, May 19th, at Carey Street, W.C.

**Dissolution of Partnership.**—Maidstone Electric Welding Co., electric and oxy-acetylene welders, Queen Anne Road, Maidstone.—Messrs. J. W. Vissenga, W. D. Vanson, and R. Newton have dissolved partnership. Debts will be attended to by Messrs. J. A. Robertson and W. D. Vanson, who will continue the business under the same style.

**Deed of Assignment.**—In the matter of William Morris, electrical engineer, Cinema Buildings, Bridgend, who made a deed of assignment to his creditors in June, 1921, the trustee, Mr. W. A. J. Osborne, gives notice that all claims of creditors must be notified to him at the offices of Messrs. Corfield & Cripwell, 119, Finsbury Pavement, before May 14th in order to benefit under a dividend about to be declared.

**Trade Announcements.**—Mr. J. W. Russell, electrical engineer, of 49A, Fore Street, Hertford, and Watford, has opened a branch business at Ware.

Messrs. John Marsden & Sons, electrical engineers, of Huddersfield, have removed their business from Aspinall's Yard, Market Place, to 1, Upperhead Row.

The Lassen Meter & Engineering Co. has been acquired by James Gordon & Co., Ltd., of Windsor House, Kingsway, W.C.2. Mr. J. J. Lassen has accepted the position of joint managing director, and will conduct the section of the business dealing with boiler efficiency appliances and instruments. The latter company specialises in the design and manufacture of water power plant.

The Hart Accumulator Co., Ltd., Stratford, London, has just opened a branch office at 6, Bridge Street, York, under the management of Mr. R. H. Rawlinson. A depôt for the repair of storage batteries is also being prepared at the same address.

**Catalogues and Lists.**—Messrs. Watson & Sons (Electro-Medical), Ltd., Sunic House, Parker Street, Kingsway, W.C.2.—Bulletins Nos. 43s, dealing with the "Ionostat," a set for all medical applications of electric energy; 45s, describing the radiological ionometer and other instruments for measuring X-ray dosage; and 46s, relating to waterproof surface intensifying screens. All fully illustrated and priced.

Welco Patents, 150, Alma Street, Birmingham.—A folder illustrating and describing the "Welco" electric pedestal heater.

Messrs. Baxendale & Co., Ltd., Miller Street, Manchester.—An illustrated folder advertising the "Electolite" small lighting and power sets.

Electrical Components, Ltd., 90, Great Charles Street, Snow Hill, Birmingham.—List No. 95, an abridged net price list of electrical accessories of all kinds, including switches, fuses, lighting fittings, and cables. Also a supplementary price list of electric fans.

Carron Co., Carron, Falkirk.—An illustrated and priced catalogue of electrical cooking appliances, showing various types of ovens, and boiling rings and plates.

The Cable Accessories Co., Ltd., Britannia Works, Tividale, Tipton, Staffs.—List No. 3, giving prices and illustrations of "Revo" electric fans; list No. 7, an illustrated price list of "Revo" fuse and switchgear; and Form 57, dealing with reflector fittings for interior lighting.

The London Factors & Agents, Ltd., 38 & 39, Parliament Street, S.W.1.—A net price list of electrical accessories, including batteries, bells, conduits, cables, lamps, switches, &c.

Messrs. Malcolm & Allan, Ltd., 42, Henrietta Street, Strand, W.C.2.—Stock lists of d.c. and a.c. motors and fans, &c.

The British Automatic Telephone Installation Co., Ltd., 82, Victoria Street, S.W.1.—An illustrated explanatory pamphlet for non-technical readers upon automatic telephone systems.

The Sunderland Forge & Engineering Co., Ltd., Sunderland.—An illustrated description of the firm's works at Sunderland, Belfast, and Blaydon-on-Tyne, with particulars of manufactures.

Messrs. Griffiths Bros. & Co., London, Ltd., Macks Road, Bermondsey, S.E.16.—Two leaflets dealing with "Shaydolite" varnish for colouring lamps, &c.

Ateliers de Constructions Electriques de Charleroi, 56, Victoria Street, S.W.1.—May list of motors and dynamos in stock.

The Reliance Telephone Co., Ltd., Goschen Buildings, 12-13, Henrietta Street, W.C.2.—A booklet dealing with the installation and maintenance of the "Reliance" intercommunication telephone system.

The English Electric Co., Ltd., Queen's House, Kingsway, W.C.2.—Publications No. 330, "The English Electric Cylindrical-balanced Valve"; No. 331, "The E.E. Relief Valve"; No. 332, "The E.E. Bucket Attachment for Impulse Wheels"; and No. 366, "The Fullagar Oil Engine for Land Purposes."

**Education and Apprenticeship.**—The Bradford Educational Authority is devoting its attention to a subject of general interest to manufacturers and contractors in this country. Under the Fisher Education Act boys are debarred from leaving secondary schools until the end of the term in which they attain their sixteenth birthday, the maximum age at which apprentices usually commence their training. In the opinion of Bradford manufacturers this prevents the entry into trades of numbers of lads of superior education and is likely to have a detrimental effect upon the standard of work. The Chairman of the Educational Authority therefore advocates a revision of apprenticeship regulations, although it would appear that the object would be more easily obtained by a suitable revision of the Fisher Act.

**Our "Contractors' Column."**—It does not appear to be generally recognised that the information given in our "Contractors' Column" is collected by us editorially and is not advertisement matter, though it is placed in our advertisement pages. Occasionally, however, our correspondents express their appreciation of the value of the section. This week a correspondent in Wales writes: "I am a regular reader of your paper, and have found in particular your 'Contractors' Column' most useful, and take this opportunity of thanking you."

**To Produce a Trade Boom?**—We cull the following from *Current Opinion*, the new official organ of the Industrial League and Council:—

THE COUÉITE.

*Every day and in every way*
*Trade is going up!*
Jones has gone where the palm trees sway
To open a branch in Mandalay:
Brown has been seven months away
Canvassing orders and goods from gay
Little New York to far Cathay:
Slaving and sweating to make things pay
Robinson down at the Works will stay.
But I—I have chosen the better way—
Good M. Coué showed me the way—
I simply sit in the office and say,
*Every day, every day*
*Trade is going up!*

A. M. L.

**Electric Café at Cardiff.**—A development of considerable interest received its send-off at Cardiff on April 28th, when the Electric House Café, 47, St. Mary Street, was opened with a luncheon given by the directors to a few of their friends. Mr. A. C. McWhirter, M.I.E.E., chairman of the directors, presided over the function, and was supported by the following members of the board:—Messrs. C. T. Allan, A.M.I.E.E., T. E. Alger, A.M.I.E.E., J. H. P. Berthon, A.M.I.E.E., W. A. Chamen, M.I.E.E., H. Ellis, M.I.E.E., T. Hood, A.M.I.E.E., D. R. Reid, and H. Wintle, A.M.I.E.E., managing director and secretary. There were also present at the luncheon Mr. C. G. Morley New, the Cardiff City electrical engineer, Mr. R. L. Horsfield, Cardiff Corporation tramway manager, and Mr. W. North Lewis, J.P., chairman of the South Wales Electric Power Distribution Co. An apology for inability to attend was read from Mr. A. F. Berry, of "Tricity House," London. The toast of the "Electric House Cafés, Ltd.," was given by Mr. Morley New, who wished the enterprise the success which, he said, it deserved. He said the idea was to bring home to the public the value of electrical appliances in the kitchen and the superiority of electrical cooking over any other method. In responding, Mr. MacWhirter remarked that the aim of the directors was to advance the use of electricity for domestic purposes and to provide the business men of the city with a sort of business men's luncheon club. The venture was unlike any other in that, although they hoped to get a little profit, they were not out for profit, but for propaganda. Their kitchen was to be so arranged that any person interested in the use of electricity might inspect the methods of cooking and be shown the right manner of handling the electric cooking apparatus. Later it was hoped to organise lectures and give demonstrations in electrical cooking, laundry work, &c.

**Hackney Electrical Exhibition.**—On Wednesday last week a well-attended exhibitors' dinner, organised by Mr. F. H. Howell, of the Falkirk Iron Co., Ltd., was held at the Great Eastern Hotel. Mr. Howell was chairman, and the principal guests were the Mayor and Councillors of Hackney, the borough electrical engineer (Mr. L. L. Robinson) and his staff, and the director of E.D.A. (Mr. J. W. Beauchamp).

The keynote of the proceedings was the enthusiastic testimony of the exhibitors to the success of the exhibition, and to the energy and enterprise of the electricity department, as well as of E.D.A., in organising and conducting the show. The Mayor commented on the large number of visitors and the great interest they displayed in electric cookers and washers, and declared that electricity was the servant of the man of moderate means as well as of the well-to-do. Mr. G. Nobbs, proposing the health of the borough electrical engineer and his staff, said the exhibition was a revelation to the exhibitors of what could be done by an enlightened electricity department; everything that a manufacturer could wish for had been provided, including an excellent tariff for domestic consumers. He suggested that the staff should receive bonuses proportional to the number of units sold and (inversely) to the cost of generation and distribution. Mr. Robinson, responding, said that the public in Hackney had a personal interest in the exhibition, as the municipality was not out to make profits, but to render public service. The department was hiring out cookers, washers, and radiators on a fair basis, and serving the community at cost plus a reasonable margin. A hearty spirit of "matey-ness" prevailed throughout the Council and the electricity department, including the workmen, and "team-work" was done by the exhibitors and the staff, as it should be throughout the whole industry. The manager, Mr. Self, was a tower of strength, and Mr. Beauchamp had rendered invaluable assistance. Councillor Jackson, chairman of the Electricity Committee, proposed the health of "The Exhibitors," and Mr. H. H. Berry, in reply, endorsed Mr. Nobbs's remarks regarding the excellence of the arrangements and the exceptional qualities of Mr. Robinson. Alderman H. Morrison, L.C.C., proposed "E.D.A. and the Electrical Press" in eulogistic terms, pointing out the value of co-operation, and remarking that the exhibition had demonstrated that the manufacturer and the municipal authority could work together to their joint benefit. In the course of his reply Mr. Beauchamp claimed that the exhibition, from the business aspect, had made a record. A reasonable tariff and a hiring scheme were essential factors if the manufacturers who exhibited were to be fairly treated. The people with few servants or none at all were the customers they should cultivate. The electrical Press could do more for them if they would tell it more fully what they were doing.

The tariff for domestic uses of electricity, mentioned above, is as follows: 2s. per 60-watt lamp or its equivalent, per quarter; energy for all purposes at 1d. per unit, 5 per cent. discount for cash within 14 days.

**Copper and Lead Prices.**—Messrs. F. Smith & Co. report May 10th:—Copper (electrolytic) bars, £67; 10s. increase. Do., do. sheets, no change. Do., do. wire rods, £77 10s.; £1 increase. Do., do. h.c. wire, no change.

Messrs. James & Shakespeare report May 11th:—Copper bars (best selected), sheet and rod, no change. English pig lead, £25 10s.; 10s. increase.

**"Falco" Cookers for Hackney.**—An interesting outcome of the Hackney Exhibition is indicated by the accompanying photograph of a dozen "Falco" cookers ready for dispatch, which was taken on Monday last. These cookers were ordered by the Hackney Borough Council for hiring-out to consumers in accordance with its new scheme for encouraging the use of

electricity for domestic purposes, which is mentioned in the adjoining column; the order was placed with the London office of the Falkirk Iron Co., Ltd., on Friday last, as a first instalment, and it will be seen that the company did not take long to comply with it, though the Hackney Corporation's specification necessitated certain departures from the makers' standard pattern.

**Manufacturing in Sweden.**—The directors of the A.B. Elektraverken report a loss of 1,981,000 kr. in 1921, as compared with a loss of 312,000 kr. in the previous year, and a portion has been covered by the absorption of the reserve fund of 450,000 kr. A large part of the loss is attributed to the necessity for writing down the stocks. The report states that the industrial depression which began in 1920, which was specially noticeable in the company's branch as a consequence of low exchange dumping, was further increased in the past year. The orders from domestic customers experienced a considerable decrease, and any noteworthy exports were not possible. During the year the directors endeavoured to reduce wages and general expenses and otherwise adapt the activity to the conditions now prevailing. Owing to falling sale prices, it was found necessary largely to write down the stocks of raw materials and finished products, while the loss on actual working was 638,000 kr. No dividend was paid either for 1920 or 1921, but a rate of 10 per cent. was distributed in 1917 and 1918.

**Chinese Notes.**—*Finance and Commerce* reports that Chinese merchants in Shanghai have raised capital for the establishment of a Shanghai-Woosung telephone company.—*Reuter's Trade Service* (Shanghai).

Ma Hui-chieh and other capitalists have raised a sum of $5,000,000 for the establishment of the "Kiao-ao Electricity Co., Ltd.," at Tsingtao. The company will undertake electrical enterprises along the Kiaochow-Tsinan Railway. Its head office will be situated at Tsingtao with branches at Tsinan, Shanghai, and Tientsin.

The Tiao Hua Electric Light Co., Ltd., at Tipu, Chekiang, has been established by Lang Er-k'ang and others. Application for registration has been sent to the Ministry of Agriculture and Commerce through the Board of Industry of Chekiang.

**Catalogues Wanted.**—Mr. B. Stuart Finch, electrical engineer, Old Bank House, Monmouth, desires to receive catalogues.

The Alco Fittings Co., of 14, Ellison Street, London, E.1, wish to receive catalogues and net price particulars of a.c. and d.c. fans, washing machines, and irons.

**Lead.**—Messrs. James Forster & Co., reporting on May 6th, state:—

"Trade reports continue very pessimistic, there being no improvement in either the building or electrical trade requirements. On the other hand, the cessation of shipments from Australia is a grave feature. The lead is being smelted but not shipped, as the present levels of prices are said to be uneconomic, but they are far above pre-war average figures, and experience suggests that if Australia cannot produce at present figures, we shall not want sufficient lead, although in the meantime the removal of 7,000 tons per month even temporarily may be awkward."

**Electric Furnace Demonstration.**—With a view to demonstrating the utility and consistent results produced with the Wild-Barfield electric furnace, demonstrations have been arranged to be held at Messrs. J. H. Holmes, Portland Road, Newcastle-on-Tyne, for a week, starting from May 15th. Invitations to witness these demonstrations are extended to anyone who may be interested, and visitors are asked to take small samples for treatment. Further information can be obtained from either the Newcastle Electric Supply Co., Ltd., or Messrs. Prangnell Partners, 47, Pilgrim Street, Newcastle.

**Book Notices.**—The Toronto *Electrical News* issued a special "Prairie Number" on April 15th. Those interested in the Canadian electrical industry, as well as the general reader, will find much in this of value. The publication deals with that part of Canada which is not so much in the eye of the British public. Much is heard of Ontario and Quebec, but Manitoba, Alberta, and Saskatchewan, with which provinces this issue deals, have been comparatively neglected. The public utility undertakings of Winnipeg receive very full treatment by high officials concerned with them. Outside Ontario, and Quebec, the Winnipeg River is the largest source of hydro-electric power, and its development is still progressing. The city itself already utilises 68,000 h.p., and the Manitoba Power Co., Ltd., is planning to harness 56,000 h.p. Another large hydro-electric plant described is that of the Calgary Power Co., Ltd., developing 31,000 h.p. Saskatoon (Sask.) has a 10,400-kW steam station, and it is stated that the production cost is only 2.77 cents per kWh, while the average selling price is 3.28 cents. Other steam stations described are those owned by the municipalities of Moose Jaw (6,000 kW), Edmonton (14,000 kW), and Regina (11,000 kW). Special attention is given to street railway operation in Calgary and Winnipeg, and the telephone systems of the prairie provinces. In Manitoba there is a telephone to every nine of the population. Other features of this issue are notes upon salesmanship in relation to the special characteristics of the Canadian supply systems and the national temperament.

"Data for Pump Users" (16 pp.). Reading: The Pulsometer Engineering Co., Ltd. This is a collection of tabulated information and formulæ relative to pumping work. Among the tables given are lists of average efficiencies, relative speeds, &c., of various types of electric motors.

Included in the May number of *Welfare Work* is a dispassionate review of a recent work on "Sharing Profits with Employés," by J. A. Bowie, M.A. The report of the Cave Committee on Trade Boards is considered, and notes on recent industrial legislation also appear.

"Practical Profit Sharing," reprinted from the *Manchester Guardian Commercial*, with an introduction by Seebohm Rowntree. Manchester: Manchester Guardian, Ltd. Price 1s.

**Applications for British Trade Marks.**—Appended is a summary of the recent applications for British trade marks, in respect of goods and productions connected with the electrical trades and industries. Any firm desiring to enter an opposition to any of the applications has one month in which to do so, from the dates given below:

Nagel Electric Toledo (lettering and design). No. 415,616. Class 6. Electric dynamos, fans, blowers, motors, &c. The W. G. Nagel Electric Co., 28-32, St. Clair Street, Toledo, O., U.S.A. (Marks & Clerk, 57 8, Lincoln's Inn-Fields, London, W.C.). May 3rd, 1922.

Lucas, British made (lettering and design). No. 418,846. Electric goods in Class 8, No. 419,972. Class 13. Electric lighting equipment for cycles and motor vehicles. Joseph Lucas, Ltd., Great King Street, Birmingham. May 3rd, 1922.

Metallam. No. 420,207. Class 13. Electric incandescent lamps (ordinary). The A. & A. Electrical Co., Ltd., 13, Farringdon Road, London, E.C. May 3rd, 1922.

**Austrian Foreign Trade.**—The foreign trade returns of Austria for 1921 show that the imports of machinery, including electrical, amounted to 18,787 tons, as compared with 20,890 tons in 1920. On the other hand, the exports of machinery increased from 43,351 tons in 1920 to 53,718 tons last year, and those of the electrical industry advanced from 4,961 tons to 6,915 tons in the two years respectively.

**British Indian Electric Committee.**—At a luncheon held by the British Indian Electric Committee on May 1st, to meet certain directors of their member companies recently returned from a visit to India, the chairman of the committee (Mr. K. A. Scott-Moncrieff, M.I.E.E.), in opening, stated that, broadly speaking, the Committee was formed to promote co-operative action by those electric supply and tramway companies which were registered in the United Kingdom and were operating in India. As instances of what the Committee had so far achieved he might mention the successful efforts which the Committee had made in the way of securing co-ordination of income tax practice in India, and also in the way of obtaining standardisation of depreciation allowances on a scale more generous to the companies than the companies' representatives in India had been successful in obtaining. The Committee had also had under consideration the alterations which the Government of India proposed to make in the Act governing the supply of electricity in India and the Rules thereunder. With regard to the Act itself, practically every recommendation put forward by the Committee had been successful. With regard to the Rules, nothing had so far been published to enable the Committee to judge to what extent its efforts had been successful. The subject which had most recently been engaging the attention of the Committee was that of the alterations which the Government of India proposed to make in the existing Boiler Laws, which, if carried into effect as drafted, would be of very serious importance to all users of boilers. Speaking of the increasing co-operation between electricity interests in India and the vast possibilities immediately available in that country, he anticipated the day in the near future when it might be possible for the managers of the supply undertakings, isolated as they were, to hold a general conference once a year on the lines of those held in Britain by municipal electrical undertakings.

Mr. J. G. B. Stone, Chairman of the Calcutta Tramways Co., Ltd., and the Indian Electric Supply & Traction Co., Ltd., said that he was firmly of opinion that the supply of electricity was one of the most promising fields for investment at the present time, and if the Government adopted a consistent line of policy many of the troubles would disappear. Mr. Stone also referred to the desirability of bringing back the rupee to its value of 1s. 4d., as against the present arbitrarily fixed 2s., which was doing a good deal of harm.

Major-General R. H. Mahon, C.B., C.S.I., vice-chairman of the Calcutta Electric Supply Corporation, Ltd., spoke optimistically of future prospects given some reasonable improvement in government from home. He considered that, to a great extent, the present trade depression was but a passing phase, and that peaceful and more prosperous conditions were returning rapidly. His company was at the present time swamped with applications for new connections, and its output had passed all former records.

Mr. Taylor pleaded for a long period of political quietness, when he felt that business would develop naturally. He referred to the cost of living, which was still extremely high, and to the somewhat difficult conditions under which Europeans in responsible positions were obliged to work.

Lord Meston, K.C.S.I., chairman of the Calcutta Electric Supply Corporation, Ltd., emphasised the remarks of the previous speakers on the need of a firm and consistent Government policy. He considered that the country was only on the threshold of electrification. The introduction of more modern plant, effective control from home, and closer co-operation between officers of undertakings working in that country would produce a splendid investment for capital.

**Glasgow Diesel Works Purchased.**—The *Financial News* says it is announced by Messrs. Swan, Hunter & Wigham Richardson, Ltd., that they have completed the purchase of the North British Diesel Engine Works at Glasgow.

**Motor Production in Holland.**—The report for 1921 of the N.V. Electromotoren Fabriek Dorot, of Dordrecht, states that the fall in sale prices continued during the whole of the year, this being attributable for the most part to competition from Germany as a consequence of the depreciated currency. Certain indications suggest that this rivalry will soon come to an end, as the various German works are overloaded with unexecuted orders and their costs of production are higher despite the fall in the mark. The unfavourable results achieved by the company in the past year were due to the general depression accentuated by the depreciation of the German mark, and to a strike of several weeks' duration. The gross profits amounted to 247,000 florins, as against 756,000 fl. in 1920, but the final result is a loss of 8,585 fl., as compared with net profits of 34,000 fl. in the previous year. As to the new financial year, the report states that raw materials and semi-finished products stand in the books at such a level that it will not be necessary to write them down for 1922. Wages have been reduced by from 10 to 15 per cent., and the general expenses will also be considerably reduced. Under these circumstances the costs of production will be lower, and it will also be possible to sell motors at lower prices. It cannot be foreseen whether the reduction in sale prices will be sufficient successfully to meet competition, the incalculable factors being the course of the mark and the capability of Germany to effect deliveries.

**Forthcoming Exhibitions.**—The following exhibitions are being organised :—

London.—July 3rd to 14th, London Fair and Market; October 13th to 23rd, Commercial Motor Exhibition.

Manchester.—October 6th to 20th, Textile Machinery Exhibition.

Canada (*Toronto*).—August 26th to September 9th, Canadian National Exhibition.

Austria (*Vienna*).—September 10th to 16th. International Sample Fair.

Belgium (*Liége*).—June and July, Technical Engineering Exhibition.

Brazil (*Rio de Janeiro*).—September 7th to November 15th. Centenary Exhibition.

Czecho-Slovakia (*Prague*).—September 24th to 30th. Sample Fair.

Esthonia (*Reval*).—September 2nd to 11th, Agricultural and Industrial Fair.

France (*Bordeaux*).—June 15th to 30th, Sample Fair; (*Lyons*), October 1st to 15th, Sample Fair.

Holland (*Amsterdam*).—June 24th to July 23rd, Inventions Exhibition; (*Utrecht*), September 4th to 9th, Sample Fair.

Italy (*Naples*).—September 16th to 30th, Sample Fair.

Jugo-Slavia (*Llubljana*).—September 2nd to 11th, International Sample Fair.

Luxembourg.—August 14th to 22nd, Fair.

Poland (*Lemberg*).—September 5th to 15th. Eastern Fair.

Trieste.—September 3rd to 18th, International Sample Fair.

**The Newfoundland Market.**—With an import trade in machinery worth between one million and one and a quarter millions sterling annually, Newfoundland should prove an interesting market to the engineering industry. Capt. E. J. Edwards, formerly H.M. Senior Trade Commissioner, in a report recently issued by the Department of Overseas Trade (price 9d.), strongly urges United Kingdom manufacturers to quote their very lowest prices to Newfoundland buyers, on account first, of American competition, and secondly, of the heavy import duties. There is a strong feeling against Newfoundland being included in Canadian agency agreements. Importers and merchants are willing and anxious to do business with the United Kingdom, either through a Newfoundland agent, direct with the manufacturer, or through a visiting representative from the United Kingdom. Capt. Edwards considers it very important that manufacturers should visit Newfoundland personally or send representatives at frequent intervals. When on a visit to Canada they are recommended to sail from England by direct boat to St. John's, Newfoundland, and, after a stay of a few days there, to take one of the frequent boats to Halifax, Nova Scotia, before commencing their Dominion tour. The report contains a short survey of Newfoundland's mineral resources. It states that their future exploitation should be carefully watched, not only by capitalists, investors and concerns requiring various minerals for manufacturing purposes, but also by engineers producing machinery and plant for mining, smelting and fabricating.

**Corporation Profits Tax.**—In a letter addressed by the Stroud Electric Supply Co., Ltd., to the Electricity Commissioners on May 1st, their attention was drawn to what would appear to be an incongruity in connection with the incidence of the above tax. The company says:—"Interest paid on temporary loans is, of course, allowed as an expense in connection with C.P.T., and similarly the recipient is not liable for C.P.T. thereon unless such interest is received from a company not liable to C.P.T.—*e.g.*, a statutory electric supply undertaking. It will thus be seen that interest on temporary loans received from an unauthorised electric supply undertaking is free from C.P.T., whereas, if received from a statutory undertaking, duty is chargeable thereon, although in neither case has the payer any liability. The matter is brought to your notice in the hope that this anomaly, whereby unauthorised undertakings are placed in a more advantageous position in obtaining credit than statutory undertakings, will be removed under the forthcoming Finance Act."

**German Electrical Industry.**—*The Times* Berlin correspondent refers, under date May 8th, to a new manufacturing group which has been formed in Germany, and is outlined in the annual report of the Linke-Hoffmann Works. The arrangement has been come to with the Allgemeine Elektricitats-Gesellschaft in view of the future electrification of the German railways and the expected demand for electrical locomotives, and has resulted in the formation of a new group, consisting of the Linke-Hoffmann Works, the A.G. Laushener and the A.E.G., and by these the "Sgahl & Walzwerk Hennigsdors" has been founded. The Linke-Hoffmann and A.E.G. have acquired an interest in the Rheinische Metallwaaren and Maschinen Fabrik of Dusseldorf, and the former's holdings in J. P. Goossens Lochner & Co., and Rudolf Lochner & Co. have been increased. The capital of certain subsidiary companies has also been increased. In 1920 the Linke-Hoffmann raised its capital by 56,000,000 marks, and of this increase the A.E.G. has taken over 30,000,000 ordinary shares. An increase of 80,000,000 marks was authorised last December, the greater part of which is being expended in improving the company's holdings in other countries. The Linke-Hoffmann gross profits for the year 1921 were 218,019,928 marks, compared with 82,000,000 in 1920 and 26,000,000 in 1919.

**Local Electrical Exhibitions.**—The Brighton Corporation intends to hold a popular electrical exhibition during October. It is proposed to recover the cost by the imposition of a small charge for admission.

The Five Towns Health and Home Exhibition opened at Hanley on May 4th with a very attractive display arranged by local contractors. Domestic appliances of all kinds are represented, and every care has been taken to ensure the comfort and convenience of visitors. Music is being provided by the bands of the Welsh Guards and the Royal Marines (Plymouth Division). A charge of 1s. is being made for admission; the show remains open until May 20th.

**Trade Conditions in South America.**—For some time past it has been held here that the prospects for doing export trade with South American countries were not yet at all promising. Students of the situation have made various estimates as to when a sufficient improvement might occur to justify enterprising trade-getting activity there by British export firms. In view of the uncertainty that is in many minds it may be useful to quote the views that were expressed in London last week by the chairman (Mr. R. J. Hose) of the British Bank of South America, Ltd. He is reported to have stated that in Brazil the depression in commerce which set in during the second half of 1920 became still more pronounced throughout 1921, and a very large number of failures took place, with correspondingly heavy losses to most of the banks. It was to be hoped that the new loan for £9,000,000 would entirely relieve the situation, and that the market for coffee might revive sufficiently to enable realisation to be made with moderate rapidity. From a purely commercial point of view the horizon was now considerably brighter than it was a few months ago. Business conditions in Argentina throughout 1921 were far from satisfactory and commercial failures were heavy, but it was encouraging to note that since the beginning of this year wheat had been leaving the country very steadily, shipments showing a very considerable increase over those for the same period of last year. This activity in the wheat market had certainly eased the general commercial situation. One of the chief features of the year was the great recovery in the wool trade, which had done much to alleviate the pressing necessities of those engaged in sheep rearing. With regard to Uruguay, the unfavourable balance of trade had been somewhat reduced; the maize prospects were fair, while the wheat crop was reported to be good.

**Engineering Strike in Czecho-Slovakia.**—The industrial struggle for lowering the cost of production in Czecho-Slovakia was intensified on May 4th by the declaration of a strike in engineering works throughout West Bohemia, including Prague. Thirty-eight establishments have closed down, affecting nearly 40,000 workmen. The employers are determined to lower wages by 10 per cent., while the employés are demanding a sliding scale according to the index figures of the cost of living.—*Reuter* (Prague).

**Swiss Aluminium Industry.**—Before and even during the war the production policy of the Swiss aluminium industry was directed towards supplying the German aluminium-working industries with raw aluminium. The depreciation of the mark and the increase in German aluminium production during the war, however, induced the German aluminium-working industries to abandon the Swiss metal. While, in 1913, 5,644,700 kg. of aluminium and even in 1920 3,542,400 kg. was exported to Germany these exports dropped in 1921 to 1,646,100 kg. This compelled the Swiss aluminium industry to look for new markets, which were found in 1921 in the United States and Japan. Thus in 1921, 3,420,600 kg. of aluminium to the value of 8,523,000 fr., found its way to the United States, and 894,100 kg., to the value of 2,075,000 fr., to Japan. Besides this, Switzerland's aluminium industry, which is concentrated in the hands of the Aluminium Industry Society, of Neuhausen (capital 42,000,000 fr.), has commenced paying more attention to the aluminium-working industries of Switzerland, and to participate financially in these. At the present time there are in Switzerland a number of aluminium rolling mills, which work up the metal into bars, plates, tubes, and wire, and which exported during 1921 1,193,400 kg. (valued at 5,402,000 fr.). Half of this amount went to the United States and one quarter to British India. The third and last department of the Swiss aluminium industry consists of several factories of aluminium vessels and other goods, the export figures of which totalled close upon 5,000,000 fr. in 1921.—*Reuter's Trade Service* (Zurich).

**Electrical Appliances Demonstration.**—In the showrooms of the County of London Electric Supply Co., Ltd., Messrs. L. G. Hawkins & Co., Ltd., are running a demonstration and display for the public. All their "Universal" electrical appliances, "Miller" electrical fixtures, &c., are on exhibition.

**Electrical Supplies in South Africa.**—The *South African Mining and Engineering Journal*, of April 15th, stated that business in electrical wares was quite good at present, and a big improvement was expected within the next month or two. Inquiries were starting again from all outside districts, and things in town generally were brisker; an important dealer said the signs were most encouraging. "Consignments are coming in freely, but Continental material is still lagging behind."

**Electricians' Strike in Melbourne.**—Five hundred electrical installation workers ceased work on May 9th as a protest against a reduction of 7 per cent. in their wages. The Union officials expected a thousand to be out by May 10th.—*Reuter* (Melbourne).

**For Sale.**—Blackpool Corporation Electricity Supply Department has for disposal a quantity of second-hand generating plant. Whitehaven Corporation Electricity Supply Department has for disposal two Babcock & Wilcox land-type water-tube boilers, 1,966 sq. ft., 160 lb. pressure, complete with superheaters and Bennis sprinkler stokers, &c., &c. Full particulars are given in our advertisement pages to-day.

**The A.E.G. in Russia.**—The Genoa correspondent of the *Manchester Daily Dispatch* quotes the Berne *Financial Review* as stating that after the signing of the Treaty of Rapallo one of the most important concessions that Dr. Rathenau obtained from the Soviet Government was for the supply of electricity to Petrograd by the Allgemeine Elektrizitätsgesellschaft of Berlin. This concession was formerly granted to a Swiss company, but was expropriated by the Soviets, who have so far paid no compensation.

**New Belgian Companies.**—The following Belgian companies have recently been formed:—Enterprises Générales Electro-mécaniques (14, Rue de Chêne, Brussels); objects: Electrotechnical manufacture, sales, installations, and studies. De Boole et Sluys Rue Middelburg (104, Boitsfort); electrical and mechanical undertakings. Vercauteren & Porta (34, Rue Neure, Alost); manufacture, installation and trade in electrical apparatus of all kinds. Licht en Kracht (Ghent); purchase and sale of all articles relating to lighting and motive power.

**Openings for Trade in the Netherlands.**—H.M. Consul-General at Rotterdam has forwarded to the Department of Overseas Trade the following extracts from the Dutch Press, concerning undertakings which may lead to openings for British trade:—

The N.V. Provinciale Utrechtsche Electriciteits Mij (Provincial Electric Supply Co., of Utrecht), of 32, Catharijnesingel, Utrecht, are preparing plans in co-operation with the management of the Municipal Electric Works and Tramways (Nicolaas Beetsstraat, 3, Utrecht), for the building of a large provincial electric power station near Utrecht. In connection with the negotiations with the authorities a definite decision on this subject will be made in a few months' time.

Proposals have been put before the Rotterdam Town Council to extend the telephone exchange by an additional building with a capacity of 20,000 lines—estimate Gld.450,000.

It is also the intention to build an additional station at the electric power undertaking at Rotterdam. This station will probably have three machines of 1,500 kW each—estimate Gld. 600,000.

In connection with different works to be carried out in the Prise d'Eau of the Dune Waterworks and at the pumping station "Leiduin," proposals have been put before the Town Council of Amsterdam for the electrification of the existing pumping stations on the Westerkanaal and the Barnaart-Schusterkanaal—estimate Gld.25,000; the laying down of a low-pressure cable for the pumping stations, and of the necessary telephone communication, and the erection of a transformer installation in the pumping station at the Barnaart-Schusterkanaal—estimate Gld.30,000; also for the erection of a steam engine and dynamo with central condensing plant—estimate Gld.32,000.

**United States Customs Tariff.**—A reprint of the essential parts of the proposed United States Customs Tariff, as reported by the Senate Finance Committee to the United States Senate, was issued on Thursday as a special supplement to the *Board of Trade Journal*.

**Indian Schemes.**—In connection with the Calcutta Corporation's water supply improvement scheme, pumping machinery will be required. The estimates of Messrs. St. George Moore and La Trobe Bateman have been approved. Tenders for electric plant are to be invited.

At the Conference of the Department of Industries that is being held at Calcutta, the subject of rural engineering is receiving attention. The expression "rural engineering" includes the use of power machinery and motors in agriculture.—*Reuter's Trade Service* (Bombay).

**Australian Representation.**—Messrs. Johnson & Phillips, Ltd., of Charlton, London, S.E.7, whose Australian branch office is in Sydney, N.S.W., would be glad to hear from other British manufacturers desirous of Australian representation, whose products could be sold in conjunction with their own to mutual advantage. Their Australian manager is at present in London, and interviews could be arranged with interested applicants by appointment.

## LIGHTING AND POWER NOTES.

**Australia.**—Victoria.—It has been definitely decided by the Victorian Government to embark upon a further electrical scheme of considerable pretensions. The undertaking will be allied to that which is at present being carried out in the extensive brown coal fields at Morwell, in Gippsland, where electricity is to be generated and transmitted to Melbourne, a distance of over 90 miles, for cheap distribution. The Cabinet has approved of a scheme presented by the Chairman of the Electricity Commission (General Sir John Monash) whereby a great portion of the country lying between Geelong and Warrnambool will be served by the Commission. Parts of this western district are given over to dairying and other areas to mixed farming. The area to be served with electric energy amounts to 120 square miles. When the demand for electricity justifies the expenditure, an extension of the scheme to Port Fairy will be embarked upon. The Premier has explained that the capital works required for this scheme are estimated to cost approximately £160,000, but that only £20,000 will be required during the next year or two. The Government has guaranteed that amount to the Electricity Commission and work will be undertaken forthwith. With reasonably good deliveries of the necessary apparatus it is thought that power will be available as far as Warrnambool within 18 months. The transmission line is to consist of aluminium conductors mounted on wooden poles. There will be transformer stations for distribution at all the larger centres.—*Reuter's Trade Service* (Melbourne).

The Morwell Scheme.—As the township of Morwell, where the brown coal deposits are situated, is five miles from the site of the new power station it has been decided to call the generating plant the Yallouon undertaking. The initial capacity of this station will be 50,000 kW, and the transmission pressure 120,000 V.

**Birkenhead.**—Extension of Supply.—The Electricity Committee has recommended to the Town Council that in order to supply Upton and Noctorum with electricity a new sub-station be erected at Upton and cables laid at a cost of £11,910.

**Birmingham.**—Power from Refuse.—The new generating sets which have been installed at the Montague Street Salvage Depôt in connection with the refuse destructor were set in motion on May 3rd by the Lord Mayor (Alderman David Davis). The generating plant has been installed at a cost of £9,000 to utilise the steam raised by the burning of house refuse in the destructor. The energy generated is sufficient to run the whole of the plant for lighting the depôt, and for charging the accumulators of the electric vehicles used by the department.—*Birmingham Post*.

**Blackpool.**—Inquiry.—Col. T. C. Ekin held an inquiry at Blackpool on May 2nd into the application of the Blackpool Corporation for sanction to the borrowing of £220,000 for electricity works extensions. The town clerk said that although the original application was for £220,000, by the provisional acceptance of tenders consideration would be given that day to £159,000 of that sum. The total expenditure on the electricity works to date was £326,357. The net debt was £107,148. Figures were given which showed that there were now nearly 5,000 consumers, and the number connected during the last twelve months established a record. It was stated that the Electricity Commissioners had expressed approval as to one of the two 5,000-kW sets, and the inspector said the question was as to the necessity for the other set.

The borough electrical engineer (Mr. C. Furness) stated that he had advised the Electricity Committee to put down modern plant, so that in the event of neighbouring authorities requiring a bulk supply Blackpool would be in a position to furnish it. The second 5,000-kW set would be held as a stand-by until the demand for electricity was sufficient for its commercial use. The inspector said that there was the possibility of a bulk supply from elsewhere before 1930. The engineer said he hoped the inspector was not seriously suggesting that Blackpool should stand by on one set until 1930. The present application was to meet demands in the Blackpool area only. It was proposed to begin the work as soon as possible. No opposition was offered to the scheme.

**Bolton.**—Loan Sanctioned.—The Electricity Commissioners have considered the Corporation's application for sanction to borrow £31,300 for extensions in connection with the electricity undertaking, and have agreed to sanction £25,000 on account. The Commissioners intimate they will be prepared to consider any further sums required when the total cost of the work has been approximately ascertained.

**Bradford.**—Loans Sanctioned.—The Electricity Committee has received the sanction of the Electricity Commissioners to the borrowing of £359,679 for purposes of the electricity undertaking, and also to the borrowing of £45,381 for land, buildings, mains, and sub-station equipment. The latter loan is subject to the following reservation: "The Commissioners have considered the application of the Corporation for suspension of sinking fund in respect of this loan, but having regard to the fact that when the supply of electricity becomes available in the Idle, Thackley and Thornton districts a fairly substantial revenue may be expected to accrue, the Commissioners cannot see their way to sanction suspension of sinking fund."

**Burntwood.**—Street Lighting.—The Parish Council has accepted the tender of the Cannock Chase Colliery Co., Ltd., for public lighting by electricity at Chase Town and Chase Terrace at £205 for the season, against £226 12s. 6d. paid for gas. The lamps to be converted are 58 gas and 9 oil.

**Bury.**—Year's Working.—There is a net profit of £1,429 on the working of the electricity undertaking for the past year.

**Camborne.**—Change-over Sanctioned.—The Urban District Council, on the recommendation of the Highways Committee, has approved the application of the Urban Electric Supply Co. to change the existing system of electricity supply from d.c. to a.c.

**Canada.**—Ontario.—A Royal Commission has been appointed by the Ontario Government to investigate the Queenston-Chippawa hydro-electric development of the Hydro-Electric Power Commission of Ontario. The commission is to consist of Walter D. Gregory, lawyer, of Toronto, chairman; Michael J. Haney, civil engineer, of Port Credit; Lloyd Harris, of the Massey-Harris Co., of Brantford; James A. Ross, manufacturer, of Toronto; and Dr. Robert A. Ross, consulting engineer, of Montreal. Very wide powers are vested in the commission, including the investigation of all estimates given from time to time in connection with the Chippawa development, the reason for their increase, the total cost of the completed project, its capacity, the method of its construction, supervision and management, and the extent to which the price of electricity will be affected by the cost of the work. In addition, the commission is empowered to investigate the Nipigon and any other power development undertaken by the Hydro-Electric Power Commission.—*Electrical World.*

**Chippenham.**—Street Lighting.—The Town Council has accepted the offer of the Electric Supply Co. for public electric lighting for six months at 6½d. per unit and £1 7s. per quarter for maintenance.

**Continental.**—Belgium.—The generating station of the Société des Centrales Electriques des Flandres at Langerbrugge has been extended by the addition of a new 6,600-kW generating set and two new boilers, the capacity of the plant now being 17,200 kW. The high-pressure mains have been extended from 218 to 245 km., and the low-pressure mains from 250 to 287 km. The capacity of the transformer sub-stations has been increased from 14,000 to 16,000 kW. The company now supplies electricity to 43 villages. The authorities of Western Flanders propose to introduce electricity for lighting and power purposes in all the villages in the province, and the company is negotiating with them for the work. With the object of ensuring greater regularity in the supply and to reduce the costs, the mains in the Heyst, Duinbergen, Knocke and Le Zoute districts on the coast have been changed from continuous to alternating current.

Austria.—The first nitrogen factory is about to be set up in Austria, its locality being Golling, in the district of Salzburg. The concern is an offshoot of the Kontinentale Stickstoff A.G., which has made an agreement with the municipal authorities to finance a scheme for the erection of a 100,000-h.p. generating station at Fusch, which is expected to be completed by April, 1923, and which will furnish the power for the working of the factory.

France.—The Energie Electrique de Maine et Anjou has applied for a concession to set up a distribution network affecting the four *départements* of Mayenne, Orne, Sarthe, and Maine-et-Loire. The first line, at 50,000 V, will supply four localities; the second, at 50,000 V, will serve ten localities; and the third, at 5,000 V, will serve five localities in the *départements* named.

By a decision come to at a meeting recently convened by the Mayors of the canton of Fontaine-le-Dun (Seine Inférieure), a concession is to be granted to a concessionaire company to be formed to establish and work an electrification scheme for the whole canton, consisting of 17 communes.

The technical officials of the *département* of Seine-et-Oise met recently to consider the preliminaries for the setting up of an electric distribution network to supply the 18 communes of the canton of Ferté-Alais with electricity for lighting and power purposes.

An electrical distribution scheme is to be established in the commune of Maule, the electricity being obtained from the Ouest-Lumière company.

**Doncaster.**—Loan.—The Corporation has decided to borrow £32,550 for extensions in connection with the electricity undertaking.

**Egremont and Cleator Moor.**—The Cumberland Waste Heat Owners Co., Ltd., is applying to the Electricity Commissioners for authority to generate and supply electricity for all purposes within the urban districts of Egremont and Cleator Moor.

**Elgin.**—Electricity Supply.—Edmundson's Electricity Corporation is preparing a scheme for the Town Council for lighting the town with electricity. Terms are being arranged to sell the undertaking to the Council, if required. It is stated that an early decision of the Town Council would enable the Corporation to supply electricity by the autumn.

**Erith.**—The West Kent Electric Co., Ltd., is applying to the Electricity Commissioners for consent to erect a generating station in the parish of Erith. A public inquiry is to be opened at the Middlesex Guildhall, Westminster, on May 30th and following days.

**Farnham.**—Proposed Increased Charges.—The Farnham Gas and Electricity Co. is applying to the Electricity Commissioners for sanction to increase the charge for electricity from 8d. to 1s. per unit.

**Holywood (Co. Down).**—Electricity Supply.—The Urban District Council has under consideration a proposal to install electric lighting in the district. A sub-committee has been appointed to consider the matter and report.

**Llanbedr.**—Electricity Supply.—The North Wales Power Co. has asked the Llanbedr Council to ascertain the number of householders likely to use electricity if the company decides to give a supply.

**London.**—Hampstead.—The L.C.C. Highways Committee reports that it has approved a proposal of the Borough Council to change over the remaining part of its supply system to a 50-cycle bulk supply system.

St. Marylebone.—The Borough Council has received sanction from the Electricity Commissioners to a loan of £9,587 for mains, transformers and switchgear.

**Manchester.**—Electricity in Bulk.—At the request of the Stretford U.D.C. the Electricity Committee has agreed to supply electricity in bulk. The committee is seeking power to borrow £240,000 for mains and distributing stations.

**Penmaenmawr.**—Electricity Supply.—The North Wales Power & Traction Co., Ltd., has intimated to the U.D.C. that it is prepared to supply electricity for electric lighting, and a committee has been appointed to enter into negotiations with a view to arriving at an agreement for a supply.

**Rawtenstall (Lancs.).**—Year's Working.—The report on the year's working of the electricity department shows a surplus of nearly £2,000.

**Rochdale.**—Correction.—We understand that the Bury Corporation has *not*, as stated in our last issue, agreed to supply electricity in bulk to Rochdale, but has merely furnished the terms for such a supply.

Year's Working.—The accounts of the electricity undertaking for the past year show a net profit of £22,649. Of this £15,649 is being carried to the reserve fund and £7,000 is set aside for the relief of the rates.

**Rotherham.**—Electricity in Bulk.—Negotiations are in progress for the Corporation to supply the Worksop U.D.C. with electricity in bulk.

**Winchester.**—Electric Cooking Appliances.—The City Council has authorised the expenditure of £250 for the purchase of electric cookers for hiring out.

**Worcester.**—Extension of Supply.—The City Council has decided to apply to the Electricity Commissioners for a special Order giving power to the Council to supply electrical energy within an extended area, including the portion of the county outside the city boundary and within a radius of three miles from the Cross at Worcester, and enabling the Council to supply in bulk to the Shropshire and Worcestershire Power Co., Ltd., and the Malvern U.D.C.

## TRAMWAY AND RAILWAY NOTES.

**Australia.**—Melbourne.—Arrangements are being made by the Railway Department for the electrification of the line between Melbourne and Mordialloc, and it is hoped to have the new system in operation before the end of June.

**Birkenhead.**—Year's Working.—There was a net profit of £2,247 on the working of the Corporation tramways during the past year.

**Blackpool.**—New Track.—The Tramways Committee has given instructions for the preparation of plans showing the proposed doubling of the tramway in Warbreck Road, between Warley Road and Derby Road, and application is to be made for sanction to carry out the work.

Reduced Fares.—The Tramways Committee has decided to issue reduced-fare tickets in books, at the rate of six for 1s., to be available on the Promenade route only, between Central station and North and South Shore respectively.

**Bury.**—Year's Working.—There was a net loss of £15,317 on the working of the Corporation tramways during the past year.

**Oldham.**—Year's Working.—The report on the year's working of the tramway undertaking for the past year shows a net surplus of £18,000, of which £1,000 is to be allocated to the accident fund of the department. There is a possibility of the fares being reduced.

**Rawtenstall.**—Year's Working.—The accounts of the tramway undertaking for the past year show a surplus of over £4,000.

**Rochdale.**—Year's Working.—There was a deficit of £19,000 on the past year's working of the tramway department.

**Stretford.**—Extension of Time.—The Urban District Council has given notice of its intention to apply to the Ministry of Transport for an extension of the time for the carrying out of the Stretford Light Railways Order, 1906, and of Railway No. 10, authorised by the West Manchester Light Railways (New Lines, &c.) Order for a period of two years commencing on June 15th, 1922.

**South-Eastern & Chatham Railway.**—ELECTRIFICATION.—*The Times* understands that the agreements between the Trade Facilities Advisory Committee, the Treasury, and the company in connection with the forthcoming electrification of suburban lines by the South-Eastern & Chatham Railway Co. are in draft, but have not yet been signed. A special meeting of stockholders for their approval will be held within a month. There will be no capital issue. The Treasury will guarantee a sum of £6,500,000, which includes principal and interest. The period named is 25 years. A construction company will be formed to undertake the electrification of the lines and will obtain the necessary funds from the Treasury. The works, when completed, and the generating station will be leased to the South-Eastern & Chatham managing committee, or their successors in any group which may be formed under the Railways Act, on terms to be arranged. Preliminary arrangements are being made to start work on the new scheme.

Application has been made to the Electricity Commissioners by the Managing Committee for consent to the establishment of a generating station at Angerstein's Wharf Charlton. A public inquiry will be opened at the Middlesex Guildhall, on May 30th.

The *Financial News* is informed that the difficulty regarding the system to be employed, which has held up the commencement of the electrification of the South-Eastern & Chatham Railway, has been settled by conference between the company and the other two principal railway companies forming the Southern group. It is understood that the system to be employed is that originally put forward by the South-Eastern Co.'s electrical engineer.

**West Bromwich.**—TRACK RENEWALS.—The Highways Committee has recommended that the tramway track from Carter's Green to the Birmingham boundary be reconstructed at a cost of £70,000; and that the track from Carter's Green to Wednesbury and Tipton be renewed and repaired at a cost of £17,000. Application is to be made for sanction to the borrowing of the necessary money to carry out the work.

## TELEGRAPH AND TELEPHONE NOTES.

**Russia.**—CABLE CONCESSION.—The *Pravda* reports that the Soviet Government has approved the project of granting the Indo-European Cable Co. a concession of the cable running through the territory of the Soviet Republic linking up with the cables of the above company in other countries. The Black Sea cable belongs to this company, joining up Odessa and Constantinople, and besides this the company has the use of the land cable run from the present Russo-Polish frontier through Odessa, Kertch, and Tiflis to the Russo-Persian frontier.—*The Times.*

**Siberian Telegraph Route.**—The Chinese Telegraph Administration announces that telegraphic communication between the Far East and Europe *via* Siberia has been re-established. Telegrams intended for transmission by this route should be marked "*via* Helampo." They will be accepted for all countries in Europe, Russia in Europe, Russia in Asia west of, and including, Habarovsk, and Outer Mongolia (Urga). Rates are as follows: Europe, $1.40; Russia in Europe, $0.75; Russia in Asia, $0.55; Outer Mongolia (Urga), $1.25.

**United States.**—WIRELESS DEVELOPMENT.—The City Government of New York has voted £10,000 for a radio plant to broadcast concerts, speeches of important visitors, and city notices, and to provide receiving stations in parks and other public places. Broadcasting to date has been controlled almost exclusively by electrical enterprises deriving their profit from the sale of receiving apparatus designed for private homes. There is a score of these enterprises now listed on the Stock Exchange, and a score of others is almost ready for listing.—*Daily Telegraph.*

TEMPORARY ARRANGEMENT IN CABLE DISPUTE.—The State Department announces that the Government has authorised the landing of the Western Union cable from Barbados at Miami, Florida. Officials explain that the authorisation for the landing is a temporary measure. The line will be sealed immediately and not permitted to operate until all American and British Western Telegraph Companies consumate the complete agreement for the relinquishment of exclusive privileges on both coasts of South America now pending.—*Exchange Telegraph* (Washington).

**Wireless Telegraphy.**—PROGRESS IN WIRELESS.—M. Henri Deslandres, director of the great French Observatory at Meudon, called attention in a recent address to the progressive increase in horse-power used in the transmitting stations of wireless telegraphy and telephony. When the first French station was established at the Eiffel Tower only three horse-power was used in each signal. In 1910 this was raised to 75, in 1914 to 150, and before the end of the war to 300. When in 1915 a station was constructed at Lyons in case the Eiffel Tower should be destroyed by the enemy the transmitting horse-power was 450. In the station erected at Bordeaux it was 1,500. The station now in construction at Ste-Assize, near Melun, has a horse-power of 2,000. In the United States of America a station is under construction with a power of 10,000 h.p.—*The Times.*

BANKING BY WIRELESS ON SHIPS.—The Farmers' Loan and Trust Co. recently announced that arrangements had been made with a leading London bank so that wireless payments might be made at any time to passengers *en route* on board the Cunard liners *Mauretania*, *Aquitania*, and *Berengaria*. Through the branch banks on board passengers similarly might also order payments to persons in the United States. This is believed to mark an innovation in banking methods on trans-Atlantic ships.—*Reuter* (New York).

**Wireless Telephony.**—A UNIVERSAL AMPLIFIER.—The Bureau of Engineering of the Navy Department has finally arrived at a successful design for a universal amplifier for radio communication and other similar purposes. Dr. J. M. Miller, of the Navy's Radio Research Laboratory in Washington, has constructed a six-stage amplifier which gives practically the same amplification from a lower limit of several hundred metres to an upper limit in the neighbourhood of 20,000 metres.—*Reuter's Trade Service* (Washington).

POPULAR "WIRELESS."—Considerable public interest has been aroused, and the manufacture of wireless apparatus has received an impetus by the statements recently made by the Postmaster-General regarding the establishment of "broadcasting" stations. A number of manufacturers have commenced to advertise wireless telephony receiving sets at prices within the reach of thousands. One firm has produced a set for use in an area the size of London at the low price of £6.

## CONTRACTS OPEN AND CLOSED.

*(The date given in parentheses at the end of the paragraph indicates the issue of the* ELECTRICAL REVIEW *in which the "Official Notice" appeared.)*

### OPEN.

**Aberdare.**—Urban District Council Electricity Department. Second-hand 500/700-kW Belliss or other a.c. steam generating set. (May 5th.)

Powell Duffryn Steam Coal Co., Ltd. Copper wire and electrical accessories for three or six months. Stores manager, Aberaman Offices, Aberdare.

**Aberdeen.**—May 22nd. Electricity Department. Structural steelwork, corrugated iron sheeting, &c., for the new boiler-house at Ferryhill. (May 5th.)

**Australia.**—MELBOURNE.—October 17th. Postmaster-General's Department. Supply of automatic switchboards and associated apparatus for two suburban exchanges at Melbourne.

June 7th. Victorian Railways. Supply and delivery of 7,190 steel rails (60 lb.); 7,390 fishplates.*

July 5th. Victorian Railways. Storage battery truck and battery charging equipment.*

QUEENSLAND.—June 30th. Municipal Council. Electric power generating plant, switchboard and other equipment.—*Reuter's Trade Service* (Melbourne).

SYDNEY.—May 29th. Department of Public Works. One 1,000-kW steam turbo-generator, complete with fittings and accessories, for the State power house at Uhr's Point.*

**Belfast.**—May 19th. Tramways Committee. Reconstruction of the permanent way under two alternative schemes. (See this issue.)

May 19th. Supply of 4 junctions and 12 crossovers. (See this issue.)

**Belgium.**—May 15th. Aeronautical Division of the Belgian Ministry of Defence. Two small generating sets and a wireless telegraphy and telephony receiving and dispatching station, at Ostend, and similar plant for Haren. At the latter place a small battery of accumulators is also required. Le Directeur de l'Aeronautique, 75, Rue de Commerce, Brussels.

May 24th. Municipal authorities of Saint Trond. Establishment of a system of electricity distribution in the town: (1) The underground h. and l.p. mains; (2) the distribution post apparatus and two transformer cabins; and (3) the overhead distribution mains and accessories. Specifications (7 fr.) from the Hotel de Ville, Saint Trond.

**Bognor.**—May 15th. Town Council. Electric lighting for pavilion, &c. Surveyor to the Council, Council Offices.

**Dorchester.**—May 24th. Electricity Department. One vertical gas engine direct coupled to a 1,000-kW d.c. generator, with gas producer plant, pipework, auxiliaries, &c. (May 5th.)

**Dundalk.**—May 23rd. Electricity Department. One 340-kW Diesel generator, one 100-kW motor generator, one 50-kW balancer, switchgear, &c.; replating 500-V storage battery. (May 5th.)

**Edinburgh.**—May 15th. Electricity Department. Six or 12 months' supply of electricity meters. (April 28th.)

**India.**—May 26th. High Commissioner's Department. Insulator cups, porcelain or glass. (May 5th.)

**France.**—NERAC, DEPARTEMENT LOT ET GARONNE.—May 25th. Municipal Council. Material and installation for an electrical distribution network at Nerac.

**Italy.**—July 31st. The State Railways announce that the period for the reception of tenders for the electrification of the Bologna-Venice-Monfalcone line, fixed previously for April 30th, 1922, has been extended until July 31st, 1922. Offers received before April 30th will be returned in order that they may be represented before July 31st.—*Reuter's Trade Service* (Milan).

**Kirkcaldy.**—June 5th. Electricity works. Steam turbine, three-phase alternator, condensing plant and piping. (See this week's issue.)

**London.**—PADDINGTON.—May 15th. Great Western Railway. Three or six months' supply of stores, including telegraph instruments, electrical apparatus, lamps, &c. (May 5th.)

BETHNAL GREEN.—May 16th. Board of Guardians. Installation of a telephone switchboard and instruments at the hospital, Cambridge Road, E.2. (May 5th.)

HACKNEY.—June 14th. Electricity Committee. Pipework and valves. (May 5th.)

STEPNEY.—June 8th. Electricity Supply Department. Three water-tube boilers, with chimneys, economisers, and accessories; two 10,000-kW turbo-alternators with condensers, accessories, and switchgear. (May 5th.)

H.M. OFFICE OF WORKS.—May 19th. Ironfounders' and smiths' work, electrical labour in day work, and mechanical labour in day work, in the Windsor district. (May 5th.)

**Manchester.**—May 23rd. Electricity Committee. Electrical storage batteries, for Barton power station. One 120-cell battery, capacity 600 amp. for one hour; one 120-cell battery, capacity 300 amp.-hours at 1.10 hr. rate. (May 5th.)

**Morocco.**—RABAT.—May 27th. Postal Department. Supply of bronze and copper wire, in two lots, deliverable by October vice; also 500 wall telephone equipments, with battery complete. Particulars from the Office des Postes, Télégraphes, et Téléphones, 75, Boulevard Brune, Paris.

**New Zealand.**—WELLINGTON.—July 4th. Department of Public Works. Three 1,320-kVA single-phase transformers, with accessories.*

**Nottingham.**—June 9th. Electricity Department. North Wilford power station. Six steel-tube fuel economisers, four steel chimneys, six induced draught fans, &c.; e.h.p. main switchgear, e.h.p. and l.p. auxiliary switchgear, cable connections, &c.; three 30-in., one 10-in., and three 3-in. electrically-driven centrifugal pumps; one 75-ton overhead travelling electric crane, one 10-ton and one 5-ton overhead travelling hand crane, &c.; two 750-kW rotary converters, one 35-kW motor generator-booster, &c. (See this issue.)

**Preston.**—May 30th. Electricity Department. Two 10,000/12,000-kW turbo-generator sets, with condensing plant, auxiliaries, and piping; one 1,200-kW turbo-generator and two a.c. 6,600/220-V d.c. sets. (April 28th.)

June 24th. Electricity Department. Boilers, stokers, economisers, fans, chimneys, feed piping, and feed pumps. (See this week's issue.)

**South Africa.**—FRANKFORT, ORANGE FREE STATE.—The Municipality is inviting tenders for a hydro-electric scheme. Particulars from the consulting engineer, Mr. W. Ingham, 101, Consolidated Buildings, Fox Street, Johannesburg.

GRAHAMSTOWN, CAPE PROVINCE.—September 1st. Power plant, alternators, switchboard, transformers, cables, &c. Specifications from Mr. F. G. Clarkson, town clerk.

**Warrington.**—May 15th. Electricity Department. E.h.p. sub-station ironclad switchgear. (May 5th.)

*A copy of the plan, specifications, and conditions of tender, &c., can be inspected at the Department of Overseas Trade (Room 84), 35, Old Queen Street, S.W.1.

## CLOSED.

**Blackpool.**—Tramways and Electricity Committee. Accepted:—

Supply of double-deck motor-bus for Thornton-Cleveleys service.—Tilling-Stevens Motors, Ltd.

**Bolton.**—Tramways Committee. Accepted:—

Right of advertising on the interior of the ventilators of the whole of the tramcars for a period of five years from the termination of their present contract (£450 a year).—F. Mason & Co., Ltd.

Electricity Committee. Accepted:—

E.h.p. switchgear, for the Bradshawgate sub-station.—General Electric Co., Ltd.

**Bradford.**—Tramways Committee.

Twelve pairs of manganese steel points, at £101 per pair.—Hadfields, Ltd.

Electricity Committee. Accepted:—

Electrical installation at the new offices and showrooms.—Jessop & Boydell, Ltd.

**Cardiff.**—Electricity and Tramways Committee. Accepted:—

Bunkers and a boiler-house roof at the Roath power station (£3,421).—Booth & Sons, Bolton.

**India.**—MESSRS. ROYCE, LTD., of Trafford Park, have just received an order from Messrs. Kerr, Stuart & Co., Ltd., of Stoke-on-Trent, for four Royce standard three-motor overhead electric travelling cranes, each of 40 tons capacity and fitted with a 10-ton auxiliary lifting barrel. The cranes are for works in India, and Messrs. Royce having long made a special study of the manufacture of electrical equipment to suit peculiar climates, the equipment for this contract is being specially manufactured to suit the climate of India.

**London.**—STEPNEY.—Coal supplies.

The Electricity Committee recommends that fresh contracts (about 12,000 tons) be entered into with Messrs. E. Foster & Co. as from July 1st for double-screened peas, at 24s. 10d. per ton, and nuts at 25s. 7d. per ton. Messrs. Foster undertake to reduce their existing contract price 5s. per ton for coal supplied during April; 7s. 6d. per ton for supplies during May; and 10s. per ton for coal supplies during June; the effect of these reductions will be a saving to the Council of about £750 on the existing contracts.

For the supply of Walsall Wood beans, the Council is at present paying Messrs. Foster 32s. per ton, and under the contract there are arrears of about 3,000 tons outstanding. In consideration of the Council's entering into a new contract for the supply as from April 1st of 5,200 tons of similar coal, Messrs. Foster will supply the same at 25s. 10d. per ton and cancel the arrears. The saving to the Council under this arrangement is estimated at £930.

Messrs. Bradbury, Son & Co. (1920), Ltd., are under contract for the supply of Tamworth beans, Notts. washed single, and/or Ansley Hall peas at 30s. per ton, which amount the firm is, in respect of supplies from April 1st to June 30th, prepared to reduce by 5s. per ton in consideration of the Council entering into a fresh contract, as from July 1st, for 5,000 tons of similar coal at 24s. per ton. A saving of £525 will be effected in this instance.

The Committee recommends that these offers be accepted.

Electricity Committee. Accepted:—

One barge Scotch (Wemyss) washed pea nuts, 24s. 10d. per ton.—J. Hudson & Co.

One mile 3-way 4 in. conduits (£891).—Sutton & Co.

Fifty tons pitch (£218).—Forbes, Abbot & Lennard, Ltd.

Twenty-eight h.p. switches for Limehouse generating station (£83 each).—A. Reyrolle & Co., Ltd.

LONDON COUNTY COUNCIL.—Education Committee. Accepted:—

Electric lighting installation at Belleville Road, Battersea (£718), and Wormholt Road, Hammersmith (£719).—A. Hawkins & Sons.

Establishment Committee. Accepted:—

NEW COUNTY HALL.

Eight electric service lifts (extension of existing contract) (£3,470).—Express Lift Co., Ltd.

Steel conduits and accessories required in connection with electrical installation (£2,889, and further quantities not exceeding £4,000).—Stella Conduit Co., Ltd.

Cast iron boxes (£264, and further quantities not exceeding £600).—Stella Conduit Co., Ltd.

Main switchboards for auxiliary lighting supply (£800).—Dorman and Smith, Ltd.

Motor booster for ditto (£850).—Crompton & Co., Ltd.

Electric fittings for office floors.—(approx. no. of fittings, 600) (£950).—P. W. Rands & Co.; (approx. no. of fittings, 960) (£1,170).—Davis, Cash & Co.; (approx. no. of fittings, 750) (£630).—Best & Lloyd.

Cut-outs for sub-distribution boards for permanent electrical installation (£230).—Dorman & Smith.

Twin flexible conductors (£150).—Hooper's Telegraph and I.R. Works, Ltd.

Supply of division bells (about 70) (£450).—Sterling Telephone and Electric Co., Ltd.

Pneumatic dispatch tube in connection with electric annunciators (£100).—Lamson Pneumatic Tube Co., Ltd.

Fire Brigade Committee.

Installation of electric lighting apparatus at the Bethnal Green fire station:

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| **G. N. Haden & Co. (accepted)** ... ... ... ... ... | **£250** |
| Springvale Electrical Co. ... ... ... ... ... | 264 |
| Stegman & Co. ... ... ... ... ... ... | 300 |
| Higgs & Hill, Ltd. ... ... ... ... ... ... | 321 |
| Commercial Telephone and Electrical Co., Ltd. ... | 349 |
| J. Biggs ... ... ... ... ... ... ... ... | 379 |

METROPOLITAN ASYLUMS BOARD.—Works Committee.

The following tenders were received for installation of electric passenger and service lifts at Tooting Bec Mental Hospital extension:—

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| Hill (J.) & Sons ... ... ... ... ... ... | £1,750 |
| Penrose Lifts, Ltd. ... ... ... ... ... ... | 2,059 |
| Titan Lift Co. ... ... ... ... ... ... | 2,080 |
| Evans (R. A.), Ltd. ... ... ... ... ... ... | 2,180 |
| Smith, Major & Stevens, Ltd. ... ... ... ... | 2,183 |
| Aldous & Campbell, Ltd. ... ... ... ... ... | 2,200 |
| Pickerings, Ltd. ... ... ... ... ... ... | 2,200 |
| City Electrical Co. ... ... ... ... ... ... | 2,210 |
| Ritchie (J.) & Sons ... ... ... ... ... ... | 2,300 |
| Express Lift Co., Ltd. ... ... ... ... ... ... | 2,320 |
| Strong (H. O.) & Sons, Ltd. ... ... ... ... ... | 2,410 |
| Etchells, Congdon & Muir, Ltd. ... ... ... ... | 2,411 |
| Bennie (J.), Ltd. ... ... ... ... ... ... | 2,440 |
| Warburton (W.) & Co., Ltd. ... ... ... ... ... | 2,458 |
| Hammond Bros. & Champness, Ltd. ... ... ... ... | 2,483 |
| Holt & Willetts ... ... ... ... ... ... | 2,500 |
| Marryat & Scott, Ltd. ... ... ... ... ... ... | 2,500 |
| Waygood, Otis, Ltd. ... ... ... ... ... ... | 2,500 |
| Medway's Safety Lift Co., Ltd. ... ... ... ... | 2,630 |
| Keighley Electrical Eng. Co., Ltd. ... ... ... ... | 2,700 |
| Heywood (S. H.) & Co., Ltd. ... ... ... ... ... | 2,985 |
| Willetts, Chas., Jun., Ltd. ... ... ... ... ... | 3,372 |

Contract Committee. Accepted:—

Magnetos for Mead ambulance station.—British Lighting and Ignition Co., Ltd.

**Loughborough.**—Town Council. Accepted:—

One 3,000-kW turbo-alternator (£29,000). Brush Electrical Engineering Co., Ltd.

One 25,000-lb. boiler, with superheater, mechanical stoker, economiser, and auxiliary plant (£15,213).—Spearing Boiler Co., Ltd.

Extensions to high- and low-pressure mains (£4,725).—Macintosh Cable Co., Ltd.

**Manchester.**—Electricity Committee. Accepted:—

Telephone switchboard at Stuart Street station.—Western Electric Co., Ltd. Cable.—Johnson & Phillips, Ltd.

In connection with the accepted tender of Messrs. Ferranti for three 6,000-kVA three-phase transformers, fans, &c., at Oldham Road B sub-station, the authority to sublet the fan to Messrs. Davidson & Co. has been rescinded, and in lieu thereof authority has been given to sublet the work to James Keith and Blackman, Ltd.

**North Wales.**—Welsh Highland Railway Co. Accepted:

Construction of light railway along the Aberglaslyn Pass to Beddgelert (about £60,000).—Sir R. McAlpine & Sons.

**Wolverhampton.**—Electricity Committee. Accepted:—

One 1,000-kW rotary converter each.—English Electric Co., Ltd. (£2,639); General Electric Co., Ltd. (2,902).

## FORTHCOMING EVENTS.

**Royal Institution of Great Britain.**—Saturday, May 13th. At Albemarle Street, W. At 3 p.m. Lecture on "The Disappearing Gap between the X-ray and Ultra-Violet Spectra. (1) Grating Results," by Prof. O. W. Richardson, F.R.S.

**Institution of Railway Signal Engineers.**—Wednesday, May 17th. At the Institution of Electrical Engineers, Victoria Embankment, W.C. At 3 p.m. Discussion on Mr. Roberts's paper on "Some Recent Developments of Token Working on Single-line Railways."

**Electricity Supply Commercial Association.**—Wednesday, May 17th. At the Grove Hall, Hammersmith Broadway, W. At 7.30 p.m. Address by Mr. G. R. Smith, general secretary.

**Institute of Transport.**—Wednesday, May 17th, to Saturday, May 20th. At the Institution of Civil Engineers. International Congress.

**Chemical Society.**—Thursday, May 18th. At Burlington House, Piccadilly, W. At 8 p.m. Ordinary scientific meeting, to be followed by an informal meeting.

**Junior Institution of Engineers.**—Thursday, May 18th. At the Café Monico, Shaftesbury Avenue. At 6.30 p.m. Annual dinner.

**Institution of Electrical Engineers.**—Thursday, May 18th. At the Institution, Victoria Embankment. At 6 p.m. Thirteenth Kelvin lecture, "Electricity and Matter," by Sir E. Rutherford, F.R.S.

**(Irish Centre).**—Meeting in conjunction with the Dublin May Agricultural Show. Tuesday, May 16th. At Leinster House, Kildare Street, Dublin. At 8 p.m. Paper on "Electro-Farming, or the Application of Electricity to Agriculture," by Mr. R. Borlase Matthews.

**(Liverpool Sub-Centre).**—Tuesday, May 16th. At the University, Liverpool. At 3.45 p.m. Lecture on "Cheapening of Electricity Supply in Great Britain," by Mr. C. H. Wordingham.

**Chief Technical Assistants' Association.**—Thursday, May 18th. At the Engineers' Club. At 6.30 p.m. Paper on "Electric Vehicles," by Mr. J. D. Spark.

## THE "ELECTRICAL REVIEW" SERVICE DEPARTMENT.

To complete replies to queries received this week we need the names of suppliers or manufacturers of :—

"Electrostan" fuse wire.

Also wanted, the London address of the Krondell Kjellin Co.

## NOTES.

**The Electrical Exhibition of 1924.**—The Electrical Engineering Section of the British Empire Exhibition, London, 1924, will be organised and space allocated by the B.E.A.M.A., under the direction of a special committee representing all branches of the electrical industry.

**Experiments at Aldwych Underground Station.**—The "Underground" is experimenting with a new mechanical device which will save the travelling public time and trouble at the less busy traffic points. At Aldwych station, which is a quiet traffic centre, a novel electrically-operated machine has been installed inside the lift, enabling the lift man to issue tickets and at the same time to control the working of his lift. The booking of tickets and the admission to the lift being thus concentrated at one time and point, and accomplished practically at one movement, there will be a considerable saving of delay and trouble to the passenger. Another interesting feature of this new arrangement is the telephone fitted to the machine, which enables the operator to communicate with any of the 2,000 telephone extensions of the "Underground" system in the event of a lift failure occurring at any point in the lift shaft. The whole apparatus, consisting of an "Automaticket" machine, lift control and telephone, only takes up as much space as two passengers.

**Fatality.**—An inquest was held on May 6th on the body of William Turner (35), of Handsworth, Birmingham, a foreman electrician, whose death took place on May 4th at the premises of Messrs. Evered & Co., Surrey Works, Smethwick. Turner was engaged, with the assistance of George Wilson, in work on a 440-V switchboard. Wilson was standing near by when he heard a groan, and immediately switched off the energy. He found that Turner's hands were tightly clutching a part of the switchboard. On arrival at the hospital, death had taken place. Wilson stated that rubber mats and pieces of wood were provided had Turner cared to use them. The coroner returned a verdict of "Accidental Death," and said he was satisfied that the firm had done everything in its power to provide for the safety and comfort of the workpeople, if the regulations were complied with.

**Macadamised Roads.**—In a circular addressed to highway authorities (No. 149a (Roads)), the Ministry of Transport has drawn the attention of highway authorities to experiments carried out by the Joint Departmental Committee on Damage to Fisheries, set up by the Ministries of Transport and of Agriculture and Fisheries, on the injury to inland fisheries caused by treating roads with tar, &c. As a result of these investigations the committee states that highway authorities should give preference to asphaltic bitumen free from tar products for the treatment of roads draining directly into fishing waters, as there is no evidence before the committee that washings from such bitumen have any deleterious action on fish or other stream life.

**Appointments Vacant.**—Two shift assistants for the Hull Corporation Electricity Department; shift engineer for Newport (Mon.) Electricity Department. (See our advertisement pages to-day.)

**Electricity and Agriculture.**—Under the auspices of the Institution of Electrical Engineers, and in conjunction with the Dublin May Agricultural Show, Mr. R. Borlase Matthews, M.I.E.E., is to repeat the paper which he read recently in London. This lecture will be given on May 16th at Leinster House, Kildare Street, Dublin.

**British Standard Specifications.**—Among the recent publications of the British Engineering Standards Association is a specification prescribing graphical symbols for electrical purposes (No. 108, 1922, 1s. 4d. post free). This has been compiled with the aid of Government departments, the Institution of Electrical Engineers, and other technical societies, industrial organisations, and experts interested in the subject. The selection has been made with the following points in view: Each symbol should be self-explanatory, easy to draw, in general use, and should relate to a single device. Special attention is drawn to Sections 7 and 8. In the former, dealing with telegraphs and telephones, the scheme of symbols and conventions adopted by the Post Office has been largely utilised. Section 8, "Radio communication," was prepared by a joint committee of the Post Office, the Admiralty, the War Office, the Royal Air Force, and Marconi's.

Another recently-published specification is No. 128, 1922, "Dimensions and Resistances of Bare Annealed Copper Wire for Electrical Machinery and Apparatus" (1s. 2d. post free). In this, resistance values have been calculated from the value for the resistivity of copper laid down by the International Electrotechnical Commission. The sizes are designated by the diameter expressed in decimals of an inch. With a view to encouraging reduction in the number of sizes commonly used the 29 sizes which constitute the even numbers of the S.W.G. are classed as "primary standard"; the remaining 28 are called "secondary standard" sizes; and the use of the third class or "exceptional standard" sizes, it is urged, should be restricted to the utmost. These specifications can be obtained from the Association's offices, 28, Victoria Street, S.W.1.

## INSTITUTION NOTES.

**Institution of Electrical Engineers.**—The annual general meeting will be held on May 25th at 6 p.m., and the annual conversazione on June 29th.

SOUTH-MIDLAND CENTRE.—At the recent annual general meeting Mr. R. A. Chattock (chairman) presented a solid silver coffee pot and milk jug of Georgian design to Mr. J. D. Morgan, the retiring hon. secretary, as a mark of esteem. Mr. Chattock stated that since Mr. Morgan took office ten years ago the membership had increased from 450 to 795. Mr. Morgan was relinquishing the position owing to the calls made upon his time by special research work he had taken up. Messrs. Rosher and Lawson also expressed their appreciation of Mr. Morgan's services to the Centre. Mr. J. D. Morgan briefly replied, saying that he had made an enormous number of friends while acting as hon. secretary.

LIVERPOOL SUB-CENTRE.—The third annual general meeting of the Sub-Centre was held on May 8th. Alderman Walker, chairman of the North-Western Centre, seconded a vote of thanks to the retiring chairman, which was proposed by Prof. Marchant. The officers for the ensuing session were elected, and the annual report adopted. The business of the meeting was followed by a concert, Alderman Walker contributing some of his Lancashire stories.

**Royal Institution.**—The annual meeting was held on May 1st, Sir James Reid, Bart., vice-president, in the chair. The annual report of the Committee of Visitors for the year 1921, testifying to the efficient management of the Institution, was read and adopted, and the report of the Davy Faraday Research Laboratory Committee was read. Fifty-seven new members were elected in 1921, and 63 lectures and 19 evening discourses were delivered. The following officers were elected for the ensuing year: President, the Duke of Northumberland; treasurer, Sir James Crichton-Browne; secretary, Colonel E. H. Grove-Hills.

**Edinburgh Electrical Society.**—The annual business meeting of the Society was held on May 5th. The chairman, Mr. D. S. Munro, gave a brief review of the increased progress of the Society during the past session, and a satisfactory financial statement was presented by the treasurer. Prizes were given to the apprentices for their competitive papers. Office bearers for the coming session were elected as follows: Chairman, R. W. J. Stark; vice-chairman, J. Walker; committee: Messrs. J. G. Mackintosh, A. Whiteley, Orr, and Carse.

**Institute of Metals.**—Professor Sir Ernest Rutherford, F.R.S., delivered the twelfth annual May lecture on "The Relation of the Elements," to members of the Institute on May 3rd, at the Institution of Mechanical Engineers. Mr. Leonard Sumner, M.Sc. (president), was in the chair. Sir Ernest Rutherford said that it had become clear that atoms were electrical structures of the same general type, consisting of a minute but massive charged nucleus surrounded at a distance by a distribution of negative electrons. The work of Moseley had shown that an unexpectedly simple relation existed between the elements. Apart from its mass, the properties of an element were defined by a whole number

which represented the charge on the nucleus and the number of the outer electrons. This number also gave the ordinal or atomic number of the element arranged in order of increasing weight. All the known elements were defined by numbers starting from 1 for hydrogen, and ending at 92 for uranium, and only a few numbers were missing. The discussion of the structure divided itself into two parts, one the laws controlling the position and movements of the outer electrons, and the other the constitution of the nucleus. It seemed clear that hydrogen nuclei were constituents of the nuclei of these atoms, and were in all probability satellites of the main system. It was believed that the helium nucleus was a secondary structure built up of four hydrogen nuclei, and that consequently the nuclei of all elements consisted ultimately of an ordered structure of hydrogen nuclei and electrons.

## OUR PERSONAL COLUMN.

***The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the* ELECTRICAL REVIEW *posted as to their movements.***

Mr. H. HODSON LANCASTER, executive officer in the Blackpool Corporation Tramways Department, has been appointed traffic superintendent of that undertaking, in succession to Mr. C. I. Baker, who has gone to Ashton-under-Lyne as tramways manager. There was a large number of applicants. Mr. Lancaster is the son of the late Mr. John Lancaster, a former Blackpool tramways manager. He had early experience in tramway work under his father, and later acted as traffic assistant manager for the West Ham Corporation, returning to Blackpool twelve years ago.

A communication just received from Cape Town states that Mr. G. H. SWINGLER, city electrical engineer, "left by last week's mail" on a holiday trip to England, and the Continent.

*The Times* records that on his retirement, at the age of 65, from the Post Office Engineering Department, at Canterbury, Mr. H. J. PORTER, who in 1884 erected the first telephone line in Canterbury, has been presented by his colleagues with a purse and a cheque.

Mr. S. C. HURRY has been appointed sales engineer to The Jackson Electric Stove Co., Ltd., of 143, Sloane Street, London, S.W.1. Mr. Hurry, who joined the company on demobilisation in December, 1919, as assistant sales engineer, has long been closely associated with electric heating and cooking developments. He commenced his training with West Ham Corporation Electricity Department, afterwards going to Torquay and Sheffield Electricity Departments to assist in popularising domestic electricity.

Mr. B. HUDSON, of Aldershot, has been appointed shift engineer, at the Southport Municipal Electricity Works.

Prior to taking up his post as street lighting inspector under the Cardiff City Council, Mr. FRANK MARSH, for nine years foreman with Messrs. Curran's Engineering & Foundry Co., Cardiff Docks, was presented, by the firm and the workmen, with a gold watch.

Hackney Borough Council Electricity Committee recommends that the 10 per cent. addition for the increase in the cost of living included in the salary of Mr. L. L. ROBINSON, borough electrical engineer, be discontinued; and that Mr. H. C. TOSSELL be promoted to the position of distribution clerk in the Electricity Department (Class 4), at £250 per annum, subject to sliding scale adjustment.

Swindon Town Council has reduced, as from March 31st last, the salary of the electrical engineer, Mr. A. NICKLIN, from £500 to £425 a year, and that of the secretary and tramways manager, Mr. T. MEDCALF, from £520 to £494. Mr. Nicklin, who is suffering from a nervous breakdown, has been granted a month's leave of absence.

MR. A. C. DEVEY, M.I.E.E., is about to retire from business after twenty-five years' service with the British Insulated and Helsby Cables, Ltd., during which period he has built up a wide circle of friendship with engineers in all parts of the country. Mr. Devey entered the electrical world in 1885 at the Hanover Square School of Telegraphy, and in 1887, responding to an advertisement in the ELECTRICAL REVIEW, he joined the well-known pioneer firm of Paterson & Cooper, under Mr. W. B. Esson; he remained with the company in this country, and with an associated company in France, until 1897, when he joined the "B.I.W. Co." His retirement is due to health considerations, and we trust that he will long enjoy the leisure which he has so well earned.

MR. J. M. L. SLATER, A.M.I.E.E., is relinquishing his appointment in the D.E.E. Department of the Admiralty in order to take up a position with the Electrical Apparatus Co., Ltd., and Messrs. Bray, Markham & Reiss, Ltd. Mr. Slater has been previously connected with the Igranic Electric Co., Ltd., and with the switchgear department of the Metropolitan-Vickers Electrical Co.

Mr. E. F. SPENCER has just resigned the position of managing director of the Aqua Electric Co., and desires to get into touch with persons interested in water heaters.

**Obituary.**—Mr. J. C. TAYLOR.—The death has occurred, at Aberdeen, of Mr. John Clark Taylor, retired superintendent of Post Office Telegraphs. Mr. Taylor, who retired on pension in 1897, lectured extensively in Aberdeen and district on electricity, telegraphy, meteorology, and astronomy.

MR. W. H. MATHIAS.—We regret to record that Mr. W. H. Mathias, J.P., a director of the Treforest Consumers' Electricity Co., Ltd., and a director of numerous South Wales colliery undertakings, passed away on Monday at the age of 74 years.

MR. JOHN WILLIAMS.—The death occurred on Tuesday at Bridgend, at the age of 73, of Mr. John Williams, one of the pioneers of the Ogmore Valley Electric Light Co.

**Wills.**—The late Mr. ROBERT ROBERTSON, commercial manager of the Clyde Valley Electrical Power Co., left £12,459.

The late Mr. S. R. BLUNDSTONE, director of various electric tramway companies, left £19,334 gross and £18,955 net personalty.

## NEW COMPANIES REGISTERED.

**G. Edward Carr, Ltd.** (181,547).—Private company. Registered May 4th. Capital, £2,000 in £1 shares. To adopt an agreement with G. E. Carr and to carry on the business of electricians, manufacturers and repairers of and dealers in mechanical and electrical appliances and lamps, armature winders, &c. The subscribers (each with one share) are: G. E. Carr, 500, Shields Road, Newcastle-on-Tyne, engineer; G. Y. Gray, 37, Grainger Street, Newcastle-on-Tyne, accountant. G. E. Carr signs as director. Qualification, £100. Registered office: 500, Shields Road, Newcastle-on-Tyne.

**Grosvenor Clark Electrical, Ltd.** (181,548).—Private company. Registered May 4th. Capital, £1,000 in £1 shares. To carry on the business of electrical engineers, manufacturers and agents for the sale and purchase of electrical fittings and appliances, &c. The permanent directors are: W. P. Grosvenor, 36, Harlech Road, Southgate, N.14, engineer; J. A. Clark, 29, Chandos Road, East Finchley, N.2, engineer; W. Clement Drew, 31, Magdalen Road, Wandsworth, S.W.18, insurance broker. Qualification, £50. Remuneration, as fixed by the company. Secretary: W. Clement Drew. Registered office 3-4, Great Winchester Street, E.C.2.

**Holes, Ltd.** (181,508).—Private company. Registered May 3rd. Capital, £1,500 in £1 shares. To adopt an agreement with S. H. Hole and C. Hole, and to carry on at Bursledon, Hants., or elsewhere, the business of general engineers, manufacturers or repairers of all types of steam, electrical or internal combustion engines or machinery, &c. The first directors are: N. H. Everitt, Swains House, Bembridge, I.W.; S. H. Hole, 61, Union Street, Ryde, I.W.; C. Hole, Tranby, Peartree Green, Southampton. Qualification: 100 shares. Registered office: 61, Union Street, Ryde, I.W.

**Sunbeam Light Co., Ltd.** (181,492).—Private company. Registered May 2nd. Capital, £250 in £1 shares. To carry on the business of agents for and dealers in electric lamps and light fittings, gas shades and fittings, oil and other lamps, &c. The life directors are: A. P. H. van den Dorpel, 38, Norry Road, Putney, S.W.1; Mrs. C. M. Thoenes, 4, Crescent Wood Road, Sydenham Hill, S.E. Registered office: 155, Praed Street, Paddington, W.

**Magdynamo Engineering Co., Ltd.** (181,483).—Private company. Registered May 2nd. Capital, £1,000 in 2s. 6d. shares. To acquire the business of magneto manufacturers and repairers and motor accessories manufacturers carried on by S. Milligan and E. Summerfield at 28, Bateman's Row, Curtain Road, E.C.2, and to carry on the business of engineers, iron and brass founders, wire drawers and metal workers, &c. The permanent directors are: S. Milligan, 19, Albany Road, N.4; E. Summerfield, 29, Thorpedale Road, Hornsey, or 19, Albany Road, N.4. No qualification necessary. Registered office: 28, Bateman's Row, E.C.2.

**Woodstock Electric Light Co., Ltd.** (181,541).—Private company. Registered May 4th. Capital, £5,000 in £1 shares. To carry on business as indicated by the title, and to adopt an agreement with the Woodstock Electric Light and Power Co. The subscribers (each with one share) are: G. W. Smith, Oxford Street, Woodstock, grocer; J. H. Dew, High Street, Woodstock, bacon curer. The first directors are: J. F. Wickson, G. G. Banbury, C. Buckingham, A. R. Lay, A. Longworth and G. W. Smith, all of Woodstock, Oxon. Solicitors: Julius, Edwards and Julius, 8, Old Jewry, E.C.2.

**Welwyn Garden City Electricity Supply Co.**—Registered on May 1st with a capital of £25,000 in 23,500 preference shares of £1 each and 30,000 ordinary shares of 1s. each. The objects are: to carry on at Welwyn Garden City the business of an electricity supply company in all its branches. The first directors are: Sir Theodore G. Chambers, K.B.E., 76, Handside Lane, Welwyn Garden City, Herts. (director, Welwyn Restaurants, Ltd., Second Garden City, Ltd., and Welwyn Garden City, Ltd., and chairman Peacock and Nilamby (Ceylon) Tea and Rubber Estates, Ltd.); J. R. Farquharson, Kilbrannan, 35, Coolhurst Road, N.8 (director, Second Garden City, Ltd., Letchworth Cottages and Buildings, Ltd., Welwyn Garden City, Ltd., &c.); C. B. Purdam, Woodside, Wilbury Road, Letchworth (director, Welwyn Restaurants, Ltd., Second Garden City, Ltd., Letchworth Co-operative Houses, Ltd., and Welwyn Garden City, Ltd.); Capt. R. L. Reiss, Brockswood Lane, Welwyn Garden City, Herts. (director, Hewitt Construction Syndicate, Ltd., Welwyn Restaurants, Ltd., London Labourers' Dwellings, Ltd., Second Garden City, Ltd., Welwyn Garden City, Ltd., and other companies). The minimum cash subscription upon which the directors may proceed to allotment is seven shares. Qualification: 100 preference shares. Remuneration (if any), as fixed by the company. Secretary: F. J. Osborn. Solicitors: Grundy, Kershaw, Samson & Co., 6, Austin Friars, E.C. No notice of situation of registered office was filed at time of incorporation. The file number is 181,468.

**Gardner Engines, Ireland, Ltd.**—Private company. Registered in Dublin April 22nd. Capital, £3,000 in £1 shares. To carry on business as electricians, mechanics, gas and oil engineers, &c. The subscribers (each with one share) are:—C. Kendrick Edwards, Abbey Chambers, Middle Abbey Street, Dublin, mechanical engineer; C. H. Hardman, 96, Lower Baggot Street, Dublin, mechanical engineer. The first directors are: K. Edwards and C. K. Edwards. Secretary: C. H. Hardman. Registered office: 94-96, Middle Abbey Street, Dublin.

**Gardner Engines, Ireland, Ltd. (N.I.23).**—Private company. Registered in Belfast April 27th. Capital, £3,000 in £1 shares. To carry into effect an agreement between Norris, Henty & Gardners, Ltd., and L. Gardners and Sons, Ltd., and to carry on business as mechanical, electrical, gas and oil engineers, and the like, &c. The subscribers (each with one share) are: C. Kendrick Edwards, The Leets, Hampton Park, Belfast, mechanical engineer; M. R. Wylie, 65, Scottish Temperance Buildings, Donegal Square South, Belfast, mercantile clerk. The first directors are: Kendrick Edwards, C. Kendrick Edwards, and two others to be nominated by the two companies mentioned above. Secretary: Mary R. Wylie. Registered office: 65, 66, and 67, Scottish Temperance Buildings, Donegal Square South, Belfast.

## OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

**Henry Summers & Son, Ltd.**—Mortgage debenture dated April 12th, 1922, to secure £400, charged on the company's undertaking and property, present and future. Holder: H. Summers, 40, Shrewsbury Road, Forest Gate.

**Minehead Electric Supply Co., Ltd.**—Satisfaction in full on December 31st, 1920, of two charges dated November 28th, 1907, and December 22nd, 1909, securing £5,000 each (filed April 28th, 1922).

**Northampton Electric Light and Power Co., Ltd.**—Particulars of £40,000 debentures and premiums at 5 per cent. authorised March 14th, and covered by trust deed dated April 11th, 1922; none issued; charged on the company's undertaking and property, present and future, including uncalled capital (ranking, *pari passu*, with £60,000 debenture stock covered by deed dated January 5th, 1921). Trustees: C. B. Fisher, C.B.E., Clipston House, Market Harborough; J. Pendered, Redwell, Wellingborough; and P. H. Page, 33, Billing Road, Northampton.

**Seale, Austen & Barnes, Ltd.**—Satisfaction in full on November 28th, 1911, of charge dated September 29th, 1911, securing all moneys then due or to become due from company to bankers. (Filed April 28th, 1922).

**Midland Counties Electric Supply Co., Ltd.**—Trust deed dated April 25th, 1922 (supplemental to trust deeds dated February 26th, 1914, November 15th, 1915, and April 14th, 1919, securing £375,000 5 per cent. debenture stock); charged on certain shares, and debenture stock, &c., in Derbyshire, and Nottinghamshire Electric Power Co., Nottinghamshire and Derbyshire Tramways Co., and Leamington and Warwick Electrical Co., Ltd. Trustees: Trustees Corporation, Ltd.

**Whitehall Electric Investments, Ltd.**—A trust deed dated April 13th, 1922, to secure £2,500,000 first mortgage debenture stock has been registered. The deed constitutes (*a*) a first specific charge on £2,715,556 stg. 8 per cent. 37-year first mortgage bonds of Compania Chilina di Electricidad, Limitada, £474,169 stg. 7 per cent. first mortgage debenture stock of Compania Electrica di Tampico, S.A., and £636,000 stg. 5 per cent. debentures of General Securities, Ltd.; and (*b*) a floating charge on the company's undertaking and other assets for the time being, including uncalled capital. The trustees for the debenture stock holders are: The London City and Midland Executive and Trustee Co., Ltd., 5, Threadneedle Street, E.C., and the Rt. Hon. Viscount Cowdray, P.C., 47, Parliament Street, S.W. "Commission, allowance or discount": £492,500.

**Northallerton Electric Light & Power Co., Ltd.** (59,301).—Return dated March 8th, 1922. Capital, £6,500 in 2,900 preference shares of £1 each, and 12,000 ordinary shares of 6s. each. 1,161 preference and 4,921 ordinary shares taken up. £2,627 6s. paid. £10 remains in arrears. Mortgages and charges, £3,900.

**Electric Light Insurance & Maintenance Co., Ltd.** (80,801).—Return dated March 2nd, 1922. Capital, £5,000 in £1 shares. 1,255 shares taken up. £1,257 10s. paid, including £2 10s. on 50 forfeited shares. Mortgages and charges, £2,226 10s.

**Brompton & Kensington Electricity Supply Co., Ltd.** (25,913).—Return dated March 30th, 1922. Capital, £300,000 in 20,000 preference and 40,000 ordinary shares of £5 each. 5,035 preference and 34,695 ordinary shares taken up. £195,000 paid on 5,305 preference and 33,695 ordinary. £1,000 considered as paid on 1,000 ordinary. Mortgages and charges, nil.

**Newcastle & District Electric Lighting Co., Ltd.** (28,022).—Return dated April 7th, 1922. Capital, £300,000 in £10 shares. All shares taken up. £297,500 paid, leaving £2,500 in arrears. Mortgages and charges, £301,180.

**Ellerd Styles & Co., Ltd.**—B. R. Morris and L. F. S. Young, of 287, Upper Street, Islington, N., were appointed receivers and managers on April 28th, 1922, under powers contained in debentures dated January 20th, 1922.

**Chase Bros., Ltd.**—W. Peet, of 37/40, Mark Lane, E.C., ceased to act as receiver or manager on April 25th, 1922.

**New Development Co., Ltd.** (112,145).—Capital, £5,000 in £1 shares. Return dated April 3rd, 1922. 1,275 shares taken up. £1,275 paid. Mortgages and charges, nil.

**Airedale Electrical and Manufacturing Co., Ltd.**—Charge on company's undertaking and property, including uncalled capital (subject to prior mortgage for £600) dated April 20th, 1922, to secure £350. Holder: P. Ainley, 8, Western Road, Milnsbridge, Huddersfield.

**Oxford Electric Lighting Co., Ltd.** (34,685).—Capital, £175,000 in £1 shares (20,000 ordinary and 15,000 preference). Return dated March 20th, 1922. 20,000 ordinary and 11,000 preference taken up. £122,560 paid on 13,200 ordinary and 11,000 preference (including £1,550 on 310 ordinary shares forfeited). £34,000 considered as paid on 6,800 ordinary. Mortgages and charges, £75,000.

## CITY NOTES.

**Lancashire Electric Light and Power Co., Ltd.**

The name of this company was changed from the Lancashire Power Construction Co., Ltd., by resolution in September last. The report for the year ended March 31st, 1922, states that the trading profits of the Lancashire Electric Power Co. (the Parliamentary Company) for 1921, after payment of operating costs, general establishment charges, and directors' fees, amounted to £94,328, out of which sum £20,000 has been applied to the reserve fund of that company, increasing it to £148,000. The profit and loss account of the L.E.L. & P. Co. shows that the balance for the year, after crediting the interest and dividend received, and debiting the interest on the debentures of this company and other expenses, was £36,796, plus £4,192 brought forward. A dividend at the rate of 6 per cent. per annum (income tax free) on 465,000 cumulative convertible first preference shares of £1 each for the year requires £25,798, and a dividend at the rate of 7 per cent. per annum (less income tax) on 137,500 fully paid 7 per cent. cumulative participating preference shares of £1 each for the year absorbs £6,737, leaving to carry forward £8,458. The extensions of the Parliamentary Co.'s power station have been completed; the first new unit of 13,500 h.p. was put into commission in March, 1921, and the second of 13,500 h.p. in the September following. These are giving satisfactory service, and the economies obtained thereby are equal to anticipations. The Parliamentary Co.'s business during the year was handicapped by the coal stoppage and by the temporary suspension in the cotton trade. Notwithstanding these drawbacks the benefits arising from the new plant have resulted in the profits of that company showing a material increase over those of the previous year. The results of the Parliamentary Co.'s business have been as follows:—

| | 1920. | 1921. |
|---|---|---|
| Units generated or purchased ... | 60,686,489 | 62,971,066 |
| Max. load in h.p. ... ... ... | 25,460 | 38,100 |
| H.p. connected ... ... ... | 44,000 | 54,700 |
| Receipts ... ... ... ... ... | £249,904 | £294,877 |
| Expenditure ... ... ... ... | £202,548 | £200,549 |
| Profit on trading ... ... ... | £47,356 | £94,328 |

The L.E.L. & P. Co., Ltd., in September last made an issue of £400,000 7½ per cent. prior lien debenture stock at 95 per cent., the proceeds of which were applied in subscribing at par for £139,000 in shares and £248,000 in debentures of the Parliamentary Co. so as to put that company in funds to meet the expenditure of the extensions and other outgoings. During the year the vacant positions on the board were filled by the appointment of Mr. Alfred Shepherd, W.S., and Mr. George Balfour, M.P., these gentlemen being appointed chairman and vice-chairman respectively. Meeting: River Plate House, E.C., May 17th.

**Ever-Ready Co. (Great Britain), Ltd.**

The report for the year ended March, 1922, states that the amount available for appropriation after writing off depreciation, one-third of the preliminary expenses, and reserving for bad debts and Corporation Profits Tax, amounts to £39,576. After paying 9 per cent. for the year on the preference shares and 9 per cent. on the ordinary, £5,152 remains to be carried forward. Early in March, 1922, a final settlement was made with the authorities of all taxation up to March 31st, 1922 (excepting Corporation Profits Tax, which is reserved for in the accounts). The sum of £4,922, in suspense in the balance sheet as at March 31st, 1921, was absorbed in the settlement. During the year 7,000 ordinary shares were issued as fully paid in acquiring one half the capital in an old-established manufacturing undertaking of a similar nature to that of the company. Satisfactory trading results have been obtained from this connection during the year.

**Lancashire Dynamo and Motor Co., Ltd.**

The report for 1921 states that after providing for depreciation, debenture and other interest, income tax and Corporation Profits Tax, the profit for the year amounts to £33,484, plus £2,444 brought forward. After paying 5½ per cent., less tax, on the preference shares and 10 per cent., free of tax, on the ordinary, also £1,400 for directors' fees, £10,000 is put to reserve for investments and £5,237 is carried forward. The past year opened with a very satisfactory order book and the works were fully occupied until the coal strike at the end of March, which largely reduced output. Orders also fell off about that period and have continued scarce. Short time has prevailed ever since and existed up to the time of stoppage arising out of the engineering trade dispute. Under these circumstances the directors consider the results satisfactory. The company's liability for excess profits duty and income tax from 1917 to 1921 is not yet adjusted, but full provision has been made to cover this. The report refers with regret to the death of Mr. Nicholas Kilvert, who had been chairman of the company since its formation. It is not proposed to fill the vacancy on the board at present. Sir Harry Vernon Kilvert has been appointed chairman.

**Calcutta Electric Supply Corporation, Ltd.**

The directors' report, submitted at the meeting held on Tuesday, showed that during the year 1921 43,078,983 units were sold, compared with 38,820,839 in 1920; but the cost of providing them was relatively higher than in the previous year, owing to the rise in wages and in the price of coal. The number of houses connected at December was 12,478, compared with 11,505 in 1920, an increase of 973. The following figures show the comparative results:—

| Year. | Houses connected. | Units sold. | Gross revenue. | Net revenue including profit on exchange. | Net revenue excluding profit on exchange. |
|---|---|---|---|---|---|
| 1920 | 11,505 | 38,820,839 | £398,382 | £268,482 | £213,324 |
| 1921 | 12,478 | 43,078,983 | £482,179 | £216,977 | £216,977 |

The demand for electrical energy continues to increase, and vigorous steps have been necessary to keep abreast of it. To assist in meeting the cost of further plant a private issue of 250,000 £1 ordinary shares was made in July last. They were offered, in the first instance, at par to existing shareholders in the ratio of 5 new shares for every 11 old, and the balance not taken up in this way was purchased by Messrs. Robert Fleming & Co. The cost of the issue was £9,446, which is to be written off out of the year's profits. The profits for 1921, including interest received on money at deposit, amount to £221,532, plus £42,386 brought forward. Debenture interest absorbs £35,601; preference dividend, £43,214; interest on consumers' deposits, £1,753; interest accrued on share prepayments, £487; cost of registering debenture trust deed in India, £2,042. Income Tax and Excess Profits Duty have been met out of reserves made last year. There is put to writing off cost of share issue, £9,446; to reserve for taxation, £6,631; transferred to reserve fund, £9,000; transferred to depreciation

and renewals fund, £43,326; transferred to insurance fund, £5,000; dividend on ordinary shares, 10 per cent. for the year, and a bonus of 1 per cent., £64,187; leaving to be carried forward £43,230. The ordinary shareholders continue to receive the benefit of the relief afforded in previous years in respect of income tax and super tax paid in India. The preference dividend is paid free of taxation on income, both British and Indian, up to 6s. in the £. The debenture interest is income tax free. It is proposed to grant to the staff in India a bonus equivalent to 2 per cent. of the net Indian profits, in respect of approved service actually rendered in the year 1921. Major-General R. H. Mahon, the deputy chairman of the board, visited India last winter, and conducted a thorough inspection of the undertaking. The general meeting was asked to pass a resolution intended to consolidate the borrowing powers of the directors as already sanctioned, and also to enable them to obtain sterling advances, if necessary, against rupees held in India.

**English Electric Co., Ltd.** The directors report that for the year ended December, 1921, the balance to the credit of profit and loss account (including £46,236 brought forward, and amounts transferred from reserves previously set aside and no longer required) is £363,659. From this is deducted: debenture interest, £52,533; interest on 8 per cent. secured notes, £100,000; trustees' fees, £360; dividend at the rate of 6 per cent. per annum on the preference shares, £11,914; leaving a balance of £168,852. It is proposed to transfer to reserve for contingencies £60,000, and to pay a dividend on the ordinary shares (payable May 31st, 1922) at the rate of 5 per cent. per annum, less tax, absorbing £53,253. There will remain to be carried forward £55,599. In view of the heavy fall in the price of materials during the year under review the directors have considered it advisable to write down the stocks of materials, &c., held by the English Electric Co. and its subsidiaries, so as to reduce them to current market values or less, and this decision has been given effect to in the present accounts. The variations of the assets shown in the balance sheet as compared with the figures of the previous year are chiefly the result of the progress which has been made towards completing the amalgamation of the company's subsidiaries, the Dick Kerr Works at Preston having been transferred to this company in April last year and the Coventry Ordnance Works having been leased as from January 1st, 1921. The falling off in orders which was general in the steel and engineering trades in the earlier part of the year under review was unhappily accelerated by the prolonged coal strike, with the result that during the later months some of the company's works were not fully employed. But for this handicap the available profits would have been higher. Meeting: May 16th, at the Connaught Rooms.

**General Electric Co. (U.S.A.).** A copy of the report of this company, which is before us, shows that during the year 1921 the orders received by the company were $179,722,000, as compared with $318,470,438 for 1920. For the first quarter of 1922 orders received have been at an annual rate in excess of $200,000,000. Unfilled orders at the close of the year, after eliminating cancellations, were $45,391,000 for large apparatus, as against $111,778,000 at the end of 1920. Net sales billed were $221,007,992, compared with $275,758,487 for 1920. The income from sales during 1921, after adequate depreciations and provision for federal taxes, was $21,676,683, and the income from other sources was $6,478,984, making $28,155,667. Interest and discount on debentures absorbs $2,078,683, and interest on notes payable, &c., $724,172, and the investment securities reserve $3,700,000, leaving available $21,652,812. Cash dividends required $13,409,522, leaving the surplus in excess of cash dividends $8,243,290. The accounts of the International General Electric Co., Inc., are excluded from this report. In any comparisons made with the reports for 1919 and 1920 this fact should be borne in mind. The net expenditures for additional land, buildings, machinery and other manufacturing equipment during 1921 were $8,907,133, a considerable part of which was for equipment of special character and subject to early obsolescence in the event of changes in design. There has been written off plant accounts as a whole the sum of $8,486,520. The net book value of all plants at December 31st, 1921, was $66,957,295. At the annual meeting in 1921 authority was given to increase the capital stock of the company from $175,000,000 to $185,000,000. The number of stockholders at December 31st, 1921, was 27,890, of whom 13,987 were women. The year 1921, with its contraction in business and the unavoidable processes of re-adjustment made necessary thereby, has been exceptionally trying and difficult.

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**Reduction of Capital.**—Turner, Atherton & Co., Ltd., and Reduced.—A petition has been presented to the Court in the Chancery of the County Palatine of Lancaster, Manchester district, for confirmation of the proposed reduction of the capital from £175,000 to £140,116.

**Pinchin, Johnson & Co., Ltd.**—The net profit for 1921 was £15,924 plus £10,588 brought forward. The dividend for the year on the ordinary shares is 7½ per cent. less tax. £1,500 is written off preliminary expenses of new capital issue and £16,512 is to be carried forward.

**Stock Exchange Notices.**—The undermentioned securities have been ordered to be officially quoted:—

Pennsylvania Water & Power.—$245,000 first mortgage sinking fund 5 per cent. gold bonds, 1940 (Nos. 10,941 to 11,185; $1,000).

Stewarts & Lloyds.—8,070 deferred shares of £1 each, fully paid (Nos. 2,630,031 to 2,638,100).

Dealings in the following have been specially allowed by the Committee under rule 148a:—

River Plate Electricity Co.—49,453 new ordinary shares of £1 each, fully paid, Nos. 297,441 to 346,893.

Application has been made to the Stock Exchange Committee to allow the following to be quoted:—

Jutland Telephone Co.—£500,000 5½ per cent. sterling bonds.

City of Wellington.—Scrip, fully and partly paid, for £519,000 Wellington City Power Station Construction and Tramway Improvements 5½ per cent. debentures, 1920, and for £174,000 Wellington City Water Supply 5½ per cent. debentures, 1920.

**Primitiva Gas Co., of Buenos Aires.**—Accounts for 1921 show a balance of revenue and interest from purchasers of the electrical section of £84,197, plus receipts from other sources, making £84,495. Deducting debenture interest, £62,064, sinking funds, interest on loans, London office expenses, &c., totalling £83,527, leaves (according to the *Financial Times*) a profit of the year's working of £968, reducing the debit balance of £462,677 brought in to £461,709. It was not until October last that the benefit of cheaper coal and freights was obtained. It has not been possible to make any provision for retiro amortisation. The sale contract of the electrical section to the Deutsch-Ueberseeische Elektricitäts Gesellschaft has been transferred to the Compania Hispano-Americana de Electricidad, which took over the assets and liabilities of the German company, and has agreed to pay additional £2,500 per annum for duration of contract.

**Ramsgate & District Electric Supply Co., Ltd.**—For the year 1921 there was a gross profit of £8,033, against £5,356 for 1920. After providing for preference dividend, interest on loans, and income tax, and adding £477 brought forward, a dividend of 10 per cent. is to be paid, £2,200 to be put to reserve, and £1,500 to reserve for depreciation, leaving £311 to be carried forward. Mr. J. C. Wigham retired from the board, and Mr. A. J. Fippard was appointed to the vacancy, but he has since taken an appointment abroad, and Mr. W. E. Brandreth has been elected in his place.

**Cleveland and Durham Electric Power Co., Ltd.**—The report shows that connections to the system at the end of last year amounted to 142,698 h.p., which, compared with the previous year's figure of 130,798 h.p., shows an increase of 11,900 h.p. The profit for the year was £40,462, which, with the balance brought forward, made a total credit of £45,821. Interest on debentures, &c., absorbed £43,945, leaving a balance of £1,876 to be carried forward. The capital expenditure on works during the year amounted to £33,628.

**Bath Electric Tramways, Ltd.**—After charging administration expenses and including £2,305 brought forward, the accounts for 1921 show an available balance of £17,433. £5,449 is required for interest on 4½ per cent. first mortgage debenture stock; £1,000 for sinking fund; and £3,750 for dividend on preference shares. £5,000 has been put to contingencies and renewals account, and £2,234 is to be carried forward to provide for contingencies and replacements.

**New Issue.**—The *Northampton Electric Light and Power Co., Ltd.*, recently offered 40,000 £1 ordinary shares to the shareholders at par, and these were taken up. The £40,000 7 per cent. second debenture stock offered at the same time to the shareholders and debenture stockholders at 102 per cent. was largely over-subscribed.

**Callender's Cable and Construction Co., Ltd.**—The directors recommend a dividend of 15 per cent. (3s. per share, of which 1s. per share was paid on November 2nd) for the year ended December 31st, 1921. The final dividend will be paid on the 26th inst. The annual general meeting will be held on May 25th.

**Peterborough Electric Traction Co., Ltd.**—After placing £3,500 to renewals fund, and paying 6 per cent. per annum on the cumulative preference shares, a dividend of 5 per cent. on the ordinary shares is recommended, carrying forward £1,271, against £931 brought in.

**Cordoba Light, Power and Traction Co.**—The directors announce an interim dividend payable on the preference shares at the rate of 7 per cent. per annum (subject to tax) in respect of the six months ended March 31st on 300,000, and in respect of the four months ended March 31st on 365,811 shares.

**Adelaide Electric Supply Co., Ltd.**—Interim dividend at the rate of 12 per cent. per annum.

**Western Union Telegraph Co.**—Quarterly dividend of 1¾ per cent. on the common stock.

**Middleton Electric Traction Co., Ltd.**—After providing for the preference dividend and paying 5 per cent. per annum on the ordinary shares, £3,308 is to be carried forward.

**Siemens Bros. & Co., Ltd.**—A final dividend of 1s. per share (5 per cent.), free of tax, is announced, making 10 per cent., free of tax, for the year 1921.

**Melbourne Electric Supply Co., Ltd.**—An interim dividend of 5 per cent., free of tax, on the ordinary shares is announced.

## STOCKS AND SHARES.

TUESDAY EVENING.

Two cross-currents are at work in the Stock Exchange markets, making their influence felt in practically every part of the House. One is the unsatisfactory state of mind produced by the Genoa Conference, which has the effect, of course, of causing people to be rather shy of Stock Exchange securities of any kind. The second is the result of the Budget, and the reduction of Income Tax, which, while it was generally expected, will continue to have an indirect bearing in the way of forcing capital into good investments of all kinds. So long as money remains as cheap as it is at present—so long, that is, as the banks give no more than 2 per cent. on deposit accounts—the gilt-edged stocks are bound to remain very firm. Within the last six months, a complete change has come over financial circumstances. Instead of being able to get six to seven per cent. with perfectly good security, the present-day investor finds himself confronted with the fact that 5 per cent. is the utmost which can be obtained, except in comparatively short-dated stocks. The level of yield to an investor has sunk to 4¾ per cent. for the best-class descriptions, and this movement finds reflection in the prices of all kinds of sound stocks and shares, ordinary as well as prior-charge.

Two new issues which have been underwritten this week are for a quarter of a million pounds each, of 7 per cent. second debenture stock, by the Calcutta Tramways Co., at 95, and 5 per cent. tax-free debentures from the Indian Electric Supply Co., for which the public are asked 94. The underwriting was concluded without difficulty, and, were it not for the unsettlement produced in the mind of the investor by the events of the past few months in India, it would be safe to say that the issues would be snapped up like the proverbial hot cakes. Indeed, had it not been for the various disturbances in the Dependency, these two companies would most likely have been able to obtain better prices for their issues, because the security in each case is good enough to have ensured, given normal conditions, a ready response from those who are on the look-out for such investments. It will be interesting to see how the issues fare; notwithstanding the nervousness that still lurks with regard to Indian affairs, it may prove to be the case that the appetite for investments will prove stronger than the apprehension just mentioned.

The electric railway market has taken a turn for the better, encouraged by the greater strength shown by the railway list as a whole. Great curiosity is displayed in the terms upon which the Underground company will make its issue of stock guaranteed by the Government, but up to the moment of writing, nothing definite has transpired. Improvement in Metropolitans and Districts is attributed partly to seasonal activities on the part of the enterprising 'bus company, whose announcement of its summer services coincides, happily, with the blaze of sunshine that ushered in the week.

The English Electric Co. has cut down its previous 8 per cent. dividend to 5 per cent. for the year lately ended. The company has done quite well, and the net profit of £210,800 is about £37,000 better than that of the previous year. The fact of the notes ranking for interest, and, also, that stocks have had to be written down, combine to render the directors conservative in the matter of dividend distribution. The carry-forward of £55,600 is about £10,000 more than that of last year, and £60,000 has been put on one side as a contingency reserve. The ordinary remain at 13s. 9d., and the preference are 17s. 6d.

General Electric ordinary at 23s. 3d. are keeping their price, and the preference hardened to 22s. 9d., the "B" preference, however, being a trifle easier at 23s. 9d. Metropolitan-Vickers preference improved to 2½. Henley's preference, Callender's preference, and British Insulated ordinary are all better. Cromptons at 1½ are a few pence harder. Edison-Swan 5 per cent. debenture stock at 64 is again a point up.

St. James's & Pall Mall ordinary at 8¾ and South Londons at 3¼ both show gains of ¼. South London preference rose to 22s. 6d., South Metropolitan preference to 23s. 9d., and the latter company's 4 per cent. debenture stock to 62½. Chelsea ordinary are also half-a-crown higher at 5½. Midland Electric ordinary shares at 1¼ are 1/16 to the good.

Of the telegraph and telephone stocks, Anglo-American deferred at 23½ show a gain of the fraction. The Eastern group is very firm. No changes in prices have occurred. Marconis at 2½ are another 1/16 up. A sharp rise carried Canadian Marconis to 12s. 9d., on rumours that the company may be absorbed by the Radio Corporation. Radio Common, after giving way to 22s. 6d., recovered to 23s. 6d., and the preferred, which dropped to 14s., are now 15s. 3d. The intention of the Postmaster-General to increase the use of radio-telephony has aroused considerable interest in the market, and people are looking round to see, if possible, which companies are likely to benefit from the giving out of work that will be required in connection with such expansion. Telegraph Constructions at 26 are 5s. higher, and, on the yield which they offer, seem to be fully-valued. Nevertheless, the demand for the shares is so persistent as to suggest that there may be something, at present not generally known, to make the shares worth the money.

Calcutta Tramways ordinary shares at 4½ and Rangoon Trams at 3¼ are both better. British Columbia Electric stocks have given way, the preferred and deferred being down 2 and 4 respectively, to the common level of 71½, although the 5 per cent. preference stock at 80 shows a gain of 2½. Mexican Light & Power Common, after its rise of last week, put on another 1½ points. Brazilian Tractions have recovered a trifle after their drop, and the Anglo-Argentine Tramway group is steady. Canadian General Electrics at 103½ show a small fall.

Rubber shares are quiet and the market is listless, with a dull tone in consequence of the fall to 8½d. per lb. in the price of the produce. Amongst armaments, Vickers hardened a trifle in anticipation of the meeting held this week. The engineering list is steady, but the protracted dispute in the trade renders the public unwilling to take a hand in the market, while the dividend reductions on the part of some of the big iron concerns have exercised a slightly depressing effect.

### SHARE LIST OF ELECTRICAL COMPANIES.

| | Dividend. 1920. | Dividend. 1921. | Price May 9, 1922. | Rise or fall. | Yield p.c. |
|---|---|---|---|---|---|
| **HOME ELECTRICITY COMPANIES.** | | | | | |
| Brompton Ordinary | 12 | 12 | 7½ | — | £8 0 0 |
| Charing Cross Ordinary | 8 | 9 | 6½ | — | 7 4 0 |
| do. do. do. 4½ Pref. | 4½ | 4½ | 8⅝ | — | 6 4 2 |
| Chelsea | 6 | 6 | 5⅝ | + ⅛ | 5 6 8 |
| City of London | 14 | 14 | 1+⅜ | — | 7 4 6 |
| do. do. 6 per cent. Pref. | 6 | 6 | 22/6 | +1/6 | 5 6 8 |
| County of London | 8 | 8 | 1½ | — | 5 8 0 |
| do. do. 6 per cent. Pref. | 6 | 6 | 1 | — | 6 0 0 |
| Kensington Ordinary | 9 | 10 | 6⅜ | — | 7 11 0 |
| London Electric | 3½ | 4 | 1⅝ | — 1/8 | 7 6 10 |
| do. do. 6 per cent. Pref. | 6 | 6 | 4⅜ | — | 6 9 9 |
| Metropolitan | 7 | 7 | 6½ | — | 6 16 7 |
| do. 4½ per cent. Pref. | 4½ | 4½ | 8⅜ | — | 6 0 0 |
| St. James' and Pall Mall | 13 | 13 | 8½ | + ¼ | 7 5 5 |
| South London | 7 | 7 | 3½ | + ¼ | 8 0 0 |
| South Metropolitan Pref. | 7 | 7 | 1½ | — | 6 4 5 |
| Westminster Ordinary | 10 | 10 | 7⅛ | — | 7 0 4 |
| **TELEGRAPHS AND TELEPHONES.** | | | | | |
| Anglo-Am. Tel. Pref. | 6 | 6 | 108 | — | 5 16 6 |
| do. Def. | 1½ | 84/3 | 23½ | + ½ | 7 8 6 |
| Chile Telephone | 6 | 6 | 6½ | — | 4 16 6 |
| Cuba Sub. Ord. | 7 | 7 | 8⅜ | — | 8 4 8 |
| Eastern Extension | 10 | 10 | 19⅜ | — | 5 3 3 |
| Eastern Tel. Ord. | 10 | 10 | 19+½ | — | 6 2 10 |
| Globe Tel. and T. Ord. | 10 | 10 | 19⅜ | — | 5 3 3 |
| do. do. Pref. | 6 | 6 | 11½ | — | 5 7 7 |
| Great Northern Tel. | 22 | 24 | 81 | — | 7 14 0 |
| Indo-European | 10 | 10 | 40½ | — | 6 8 5 |
| Marconi | 25 | 15 | 2⅜ | + 1/16 | 6 0 0 |
| Oriental Telephone Ord. | 12 | 12 | 12 | + ¼ | *5 1 1 |
| United R. Plate Tel. | 6 | 6 | 7⅞ | + 1/16 | *5 7 6 |
| West India and Panama | Nil | Nil | 5/- | — | Nil |
| Western Telegraph | 10 | 10 | 19⅜ | — | *5 3 3 |
| **HOME RAILS.** | | | | | |
| Central London Ord. Assented | 4 | 4 | 87 | +1 | 5 19 5 |
| Metropolitan | 1½ | 2½ | 45 | +3¼ | 5 0 0 |
| do. District | Nil | 1 | 35 | +1 | 2 17 2 |
| Underground Electric Ordinary | Nil | Nil | 9½ | — ½ | Nil |
| do. do. "A" | Nil | Nil | 6/6 | —6d. | Nil |
| do. do. Income | 2 | 4 | 77½ | —1 | *5 3 3 |
| **FOREIGN TRAMS, &c.** | | | | | |
| Anglo-Arg. Trams, First Pref. | 5½ | 13½ | 83 | — | 7 11 9 |
| do. do. 2nd Pref. | Nil | 5½ | 4 | — | 6 17 6 |
| do. do. 5 per cent. Deb. | 5 | 5 | 84½ | — | 5 18 4 |
| Brazil Tractions | Nil | Nil | 49½ | + ½ | Nil |
| British Columbia Elec. Rly. Pfce. | 5 | 5 | 80 | +2½ | 6 5 0 |
| do. do. Preferred | 5 | 9⅜ | 71½ | —2 | *6 9 6 |
| do. do. Deferred | 3 | 13½/- | 71½ | —4 | *3 7 6 |
| do. do. Deb. | 4½ | 4½ | 78 | — | 5 16 5 |
| Mexico Trams. 5 per cent. Bonds | Nil | Nil | 70½ | — | — |
| do. do. 6 per cent. Bonds | Nil | Nil | 36½ | — | Nil |
| Mexican Light Common | Nil | Nil | 23½ | +2 | Nil |
| do. Pref. | Nil | Nil | 54 | — | Nil |
| do. 1st Bonds | Nil | 5 | 74½ | — | 6 14 3 |
| **MANUFACTURING COMPANIES.** | | | | | |
| Babcock & Wilcox | 15 | 15 | 3 | — | 5 6 8 |
| British Aluminium Ord. | 10 | 10 | ⅜ | — | — |
| British Insulated Ord. | 15 | 15 | 2 | + 1/16 | 7 10 0 |
| Callenders | 15 | 15 | 2 | — | 7 10 0 |
| do. 6% Pref. | 6⅜ | 6⅜ | 1⅞ | + 1/16 | 5 9 5 |
| Crompton Ord. | 10 | 10 | 22/6 | +6d. | 8 17 10 |
| Edison-Swan | 10 | — | 5/- | — | — |
| do. do. 5 per cent. Deb. | 5 | 5 | 64 | +1 | 7 16 4 |
| Electric Construction | 10 | 10 | 1½ | — | 6 0 0 |
| English Electric | 8 | 8 | 12/9 | — | 7 5 8 |
| do. Pref. | 6 | 6 | 7 | — | 6 17 2 |
| Gen. Elec. Pref. | 6⅜ | 6⅜ | 22/9 | +6d. | 5 14 3 |
| do. Ord. | 10 | 10 | 23/3 | — | 8 13 0 |
| Henley | 15 | 15 | 2⅜ | — | 7 1 8 |
| do. 4½ Pref. | 4½ | 4½ | 4⅞ | + 1/16 | 5 4 4 |
| India-Rubber | 10 | — | ⅜ | — | — |
| Met.-Vickers Pref. | 8 | 8 | 2⅝ | + ⅛ | 6 8 0 |
| Siemens Ord. | 10 | 10 | 27/6 | — | *7 5 5 |
| Telegraph Co | 20 | 20 | 35 | + ½ | *4 12 6 |

* Dividends paid free of Income Tax.

# THE IMPROVEMENT OF ELECTRIC LIGHTING PLANTS.

By R. GILLESPIE WILLIAMS.

Among the many useful inventions of the last fifty years, none perhaps is of greater interest than the small electric lighting plant. These sets enable householders, who are isolated from an outside lighting supply of any description, to have their own independent lighting system.

Lighting plants at present may be divided into two classes: sets capable of taking also power and heating appliances, and those suitable for lighting alone, the latter class being by far in the majority, and generally taking the form of small automatic (or semi-automatic) lighting sets.

In an article which recently appeared in the Electrical Review, the writer aimed to bring out the superiority of the oil engine and belt-driven dynamo, and to show that generally these are preferable. There is little doubt technically that this is the case, but intending purchasers do not always desire to spend so much money, especially for installations of from 20 to 50 lights.

For small installations, therefore, where lighting alone is required, the automatic or semi-automatic type plant is a very valuable asset, provided—and this is not always the case—that the plant is of sufficient capacity for the job. Unfortunately, owing to somewhat exaggerated claims in the advertising literature, several automatic sets have been installed where they should not have been, and the subsequent failure of these sets to operate satisfactorily has led to unfavourable opinions regarding them.

A word may be said here regarding advertising literature, for this does not always convey an accurate impression of actual output. The advertising literature should contain straightforward statements of construction, design, and output, but it is wiser that detailed descriptions of the uses the set may be put to, should be given small space and left to the contractor or engineer undertaking the job. The instances in which plants have been sent abroad and proved utter failures owing to misleading literature and inaccurate salesmanship statements are far too common, and the smaller sets in particular would be brought into better repute if less attention were given to the advantages, and more to the capacity, of lighting sets.

For some years it has been the wish of both engineers and the public to utilise lighting plants for other purposes than lighting, especially for electric cooking and heating. For the time being it does not seem possible seriously to consider electric heating from lighting sets, but there is no reason why electric cooking should not be done.

A fair-sized electric cooking combination consumes a maximum of, say, 4,000 watts, which with a 100-volt installation means a current of 40 amperes. Assuming that the maximum loading is not continuously in use, a 300-ampere-hour 100-volt accumulator battery would answer the purpose for both lighting (50-light installation) and cooking. Now, the cost of this battery would be somewhere about £300, but for lighting alone, assuming the installation to be for 50 lights, an outlay of £110 would cover the cost of the accumulators. It will thus be seen that the purchaser is called upon to expend nearly £200 on the additional batteries alone for the privilege of electric cooking, which, together with an increase in the cost of the actual plant, makes the proposition far too expensive to be generally taken up.

The alternative to working from the battery is direct generating, and it will be found that in this direction alone is the solution of the problem. For one thing, in the case of the cooking installation just mentioned, the voltage could be 200 volts, reducing the current to 20 amperes. It has generally been recognised that in such cases of direct generating, the most economical method is to run the lighting off a small accumulator battery, while supplying current for the cooking, &c., direct from the dynamo.

The present system has its disadvantages, inasmuch as it is not very convenient to have to specially start up the engine to do a little cooking. It would be far more advantageous to design the engine to start up automatically when cooking is required. There is no particular difficulty in the way of this arrangement, except perhaps a little prejudice, the dynamo operated from the lighting battery providing an excellent self-starter for the engine.

The fact has got to be faced that direct generating is going to play a very important part in lighting plant construction, and we may expect to see direct generating for lighting as well as power in the near future.

It may be said that little would be lost by dispensing with the accumulator battery; indeed, the points in its favour may be summed up in a few words: its advantage lies in the fact that the supply is available at an instant's notice, without the necessity of specially starting up the engine.

Apart from this, it could be easily dispensed with; it is not necessary to remind those with experience in lighting-plant work that the accumulator set is responsible for most of the troubles encountered. Direct generating alone presents a satisfactory solution to the difficulties of practical output and low outlay.

The prevalent notions that a direct generating plant must necessarily break down, or that the system cannot be satisfactorily put into practice, are merely opinions, and liable to contradiction by successful results. A successful engineer is usually conservative, and it is but natural therefore to encounter adverse criticisms of direct generating, but these are very seldom supported by actual personal experience, and are more often actuated by belief in accumulator charging and lack of desire to change the system. There is, however, a great need for a change of system, as will be seen by the case of the cooking installation just considered.

With direct generating the primary difficulty is fuel consumption. To obtain economical results, the proportion of the fuel consumed to the number of lamps must be as nearly *pro rata* as possible.

This side of the question, however, has been receiving much attention, and exhaustive experiments have been and are being carried out in connection with the subject. By the use of a tension governor, whereby the effort transmitted to the dynamo by the engine controls the feed valve, very nearly *pro rata* results have been obtained, the proportions being fairly even above 10 per cent. of full load, and the highest efficiency at three-quarter full load.

Fresh difficulties are also introduced into the design of the engine, and although the basis of design will remain the same, the engine—in the smaller sizes at least—will differ considerably from those employed in present-day practice for lighting plants.

The engine in favour now for small-plant work is the single-cylinder, two-stroke engine, on account of its extreme simplicity. The importance also of a steady speed when direct coupled to a dynamo cannot be exaggerated, and the ordinary oil engine is therefore unsuitable for this work.

Other questions of importance are wear and tear and possibility of breakdown. The two-stroke engine is by far the simplest, and therefore less likely to break down by reason of faulty parts, but the wear and tear on the engine is greater. The fuel consumption also of the two-stroke engine is higher than that of a four-stroke engine of the same output.

All points considered, it seems far more satisfactory to use a four-stroke engine for direct generating, provided that the design is such that an even and steady speed will be obtained.

The resistance of the tappets and valve gear is far more responsible for the somewhat uneven speed than the four-cycle operation, and provided therefore this point can be satisfactorily dealt with, the main difficulty is met.

A new era has been reached in internal-combustion engine design in the last few months. The production of a four-cycle engine with no tappets or valve gear other than a cylindrical sleeve valve is tending to revolutionise design in this direction. This engine is almost ideal for direct generating. The cylinders are cooled by sucking a powerful draught of air through ports in the cylinder castings. The suction is created by the fly-wheel, which is shaped internally in the form of a fan. The absence of tappets and springs in the valve-gear enables a very steady speed to be maintained, and, for lighting plant work, the engine is admirably adapted. What remaining scruples opponents to direct generating may have should be dispelled by the use of this engine. It is claimed that it is almost impossible for it to break down, and consideration of its features tends to bear out this statement.

A point that has not yet been mentioned is the question of expenditure. It is generally considered more expensive to manufacture an engine for direct generating—but with the type of engine under consideration this does not seem to hold so true, within certain limits.

To facilitate the production of an even and steady speed, two cylinders may be used instead of one, but this tends to bring up the cost of the engine. Single-cylinder engines are used with success for direct generating, and there seems to be no need to depart from this design, except for the perfecting of the system and the production of an improved and more scientific plant. But for cases in which low expenditure is the primary object, single-cylinder engines may be successfully used.

There seems to be no reason at all why a 1.5-kW, 100-volt direct generating plant of 3.5 h.p. should not be produced at the retail price of £150. Compared to a battery charging plant of the same output and voltage, retailing at £260, the commercial possibilities of direct generating may be seen.

In the majority of cases where an electric lighting set is installed, the purchasers desire to use electrical appliances far beyond the capacity of their plants. A number of inquiries which result in disappointment to the inquirer are caused through a keen appreciation of the many advantages electricity has to offer, and a personal desire to experience them. Electric cooking is often wanted, but it does not require much diplomacy on the part of a salesman to induce an inquirer to remain contented with a coal fire as far as heating is concerned.

Where electric cooking begins to be considered it will be seen that the higher the voltage the better, and here it is that the accumulator charging plant begins to fail. A pressure of 200 volts is perfectly practical with direct generating, but not so very practical with accumulators.

The adoption of 110 volts, as at present with large lighting plants, means that the cost of wiring is heavy, and particularly with electric cooking when 4,000-watt loads begin to be considered. It is better to employ 200 volts.

Trade begets trade, and the installation of 3 to 4-kW plants where at present 1.5-kW plants are being used, will not only liven up the whole electrical trade, but increase the demand for lighting plants themselves.

It would be, of course, advisable, in the event of a plant of some 8 or 10 h.p. capacity being installed, to run the lighting supply off a small accumulator battery of low voltage, specially installed for that purpose, as the percentage of the lighting load compared to the total load would be so small that economical results would not be obtainable.

The automatic control gear is not such a complicated matter as at first appears the case. All that is required of it is, as soon as a circuit is closed, to start up the dynamo as a motor, and, when the engine is firing and running steadily, convert it back to a dynamo.

Solenoid and contactor switches operated electrically from the starting battery, and controlled by such factors as engine speed and generator output, will enable a fool-proof system of control gear to be obtained.

It should be remembered in considering fuel consumption that the loss of 30 per cent. of current experienced in battery-charging is not experienced with direct generating, and this saving will more than offset any small fluctuations in the engine's fuel consumption.

There are many possible systems of design, but the writer is not urging, nor does he believe in, what may be termed "freak" mechanisms, but only mechanisms of a straightforward and practical nature, which may be rendered reasonably immune from breakdown by sound workmanship and principle.

## GERMAN COMPETITION IN ITALY.

Of the many British products that formerly had a profitable sale in Italy only four are at present likely to find buyers. Such is the opinion expressed by the British Commercial Secretary at Rome (Mr. Henderson). The four in question are textile machinery, tinplate machinery, machinery accessories such as belting, and English cloth. Thus three of the four are of interest to the engineer. The rate of exchange between the lira, on the one side, and sterling or the mark on the other, helps German competition and constitutes a serious drawback to British trade.

It may be that Germany is losing some of the advantages in export trade, which she has enjoyed owing to the depreciation of the mark. But, even if that proves to be the case, the low exchange value of the lira compared with sterling will remain a serious obstacle to our commercial activities. Although there is a strong movement in Italy to prevent the purchase of German material, the Commercial Secretary considers it highly improbable that the Italian Government will introduce any legislation against low-exchange dumping. The anti-German sentiment has been effective in stopping the purchase of certain railway plant in Berlin, but there is still a possibility that Germany will be allowed to undertake certain public works by way of reparations.

On the subject of German imports, Mr. Henderson says, during the first half of 1921 the volume of trade between Italy and Germany was practically the same as between Italy and France. Germany thus took the third place along with France among the countries with whom Italy trades, as compared with sixth place in the corresponding period of the previous year. Moreover, the volume of German trade was three-quarters that of Great Britain, as compared with one-quarter in 1920. Although her trade has thus largely increased, there is no evidence that Germany has, as yet, regained anything approaching to the dominating position which she previously held with regard to industrial and commercial enterprises in Italy. There is no reluctance to purchase German goods, but there is a strong feeling against anything which might tend to reduce Italy to the state of economic dependence in which she used to be. This was shown in the wave of popular indignation excited by the publication of what purported to be a despatch written by the German Commercial Attaché, in which he was said to have set forth the various methods by which Italy could be again brought into dependence on Germany.

**Waning U.S. Competition.**

America is in the same position as Great Britain in respect of the handicap imposed by the appreciation of her currency, and her trade with Italy cannot but be affected by the falling off in Italian exports which will take place if and when the new American tariff comes into force. There have been rumours of various activities including a plan for sending semi-manufactured articles from America to be made up in Italy, but no scheme of this nature has so far been made public. The danger that America would replace Great Britain as the principal source of Italy's coal supplies, appears less than it did a year ago. The quality of English coal is preferred, and the extra freight makes it difficult for the American product to compete on an economic basis.

The report describes the struggles which the metal industry has undergone in endeavouring to maintain the position which it reached during the war. The manufacture of cast iron is a problem due to the need to import raw material, especially coal. Similar difficulties in connection with steel

manufacture have induced producers to limit the production of ingots and to concentrate on the rolling mills and forges where coal can be replaced by electric energy.

Much attention continues to be devoted to the development of hydro-electric power for railways and industry. The position with regard to railway electrification has been described recently in the pages of the Review.

**Water Power.** As to water power, in 1915 there were 329 establishments of over 300 h.p., which developed a total force of 935,000 h.p. In 1920 there were 383 similar establishments developing 1,152,120 h.p., and 54 (359,210 h.p.) were under construction. There were also 300 establishments of under 300 h.p., representing a total force of 300,000 h.p. In addition to the above there are several large schemes in hand which will not be completed for some time. These include the artificial lakes in the valleys of the Reno and the Imentra, in the Bologna district, which will be used in connection with the electrification of the trans-Appenine railway between Emilia and Tuscany: similar work in the Abruzzi: the Silani lakes in Calabria, and the Tirso lakes in Sardinia. These schemes are calculated to produce 700,000 h.p.

The artificial lake at Tirso, it is said, will have a capacity of 416 million cubic metres, and will be the largest in Europe, and the third largest in the world.

The progress made during 1920-21 on the hydro-electric power stations for use in connection with various railway lines is as follows:—

The Melezet was completed. The work on the Bardonecchia station which uses the water power of the Rochesmolles was brought to an advanced stage. A start was made on the central station of Saviana and Costrola on the Reno and Linrentra near Bagni della Poretta, and also on the station on the Sagittario near Anversa Scanno.

**Telephone and Telegraph Work.** The Government has been authorised to expend 150 million lire on telegraphs and telephones, the expenditure to be spread over four years. The immediate programme as regards telephones is:—(1) The completion of the automatic exchanges in the principal towns; (2) the laying of new lines to carry the increased traffic; (3) the connection of 409 important towns with the trunk lines; (4) the re-establishment of direct telephone communication with the principal cities in Central Europe; (5) the improvement of audibility between the extremities of Italy; (6) the completion of the laying of trunk line cables between Milan, Genoa and Turin; (7) the erection of wireless stations.

## INDUCTION TYPE SYNCHRONOUS MOTORS.

### Discussion at Edinburgh.

At a meeting of the Scottish Centre of the Institution of Electrical Engineers, Mr. L. H. A. Carr read his paper on the above subject (an abstract of which appeared in our issue of January 6th), and in the course of the subsequent discussion

Mr. C. W. Marshall said he understood that it was a fairly common Continental practice to supply the rotors of induction motors of the ordinary type with direct current in order to improve power factor, but no details of the methods employed had been disclosed.

Mr. A. E. McColl thought that one of the principal reasons why they should consider synchronous plant, or types of induction motors which had the characteristics of synchronous plant, was the extremely low power factor which had to be tolerated nowadays. With district supply authorities the territorial ramifications would be such as to preclude the possibility of giving secondary distribution by means of direct current, and adherence to a.c. supply usually involved the power authority in all the losses consequent on low power factor. The chief offender was the comparatively small induction motor where the ratio of actual mechanical load to the rated output was small. He saw no hope in that case of the synchronous induction motor displacing the ordinary induction motor, as it became difficult to justify the difference in cost in the smaller sizes, and the static condenser would, on 50-cycle circuits, successfully meet the competition of the synchronous induction motor. This new type, however, had an assured future, particularly in its application to loads of an intermittent nature. In endeavouring to better the power factor of the supply authorities' mains, any proposition involving additional outlay was very coldly received. Until the difference in cost between an ordinary induction motor and the proposition the author made was lessened, it would be difficult to secure the adoption of that type of motor. However, when the adoption of tariffs involving power-factor rebates and penalties became uniform throughout the country, the author would become busy.

Mr. D. S. Baddeley would have liked to hear more of practical results. He explained that with a 3-phase winding on the rotor, when running as a synchronous motor, the phases were unbalanced electrically. The Oerlikon Co. appeared to have seen that objection, and took out patents for sectionalising the windings. What was the effect on the exciter system with that type of synchronous motor? It appeared that in changing over a heavy shock was thrown on the excitation system momentarily. The maximum voltage at the moment of starting (2,000 volts) appeared to be dangerous when unskilled labour was employed. A synchronous motor manufactured by Messrs. Crompton & Co., Ltd., employed a 2-phase rotor winding with the exciter permanently in circuit. That type appeared to be greatly simplified in its starting gear, starting up as an ordinary induction motor and pulling into synchronism automatically without the employment of any change-over switches, &c. Also, the liquid starter and the exciter circuits were "earthed," eliminating any danger from the momentarily high voltage at starting.

Mr. J. F. Nielson wished the synchronous induction motor had come before his notice at a very much earlier date, and thought the author might have said more about how the costs of supply could be cheapened.

Mr. G. Austin pointed out, with regard to the motors which were installed in Dundee, that they were on the 3-phase principle, and designed on very liberal lines, with very good clearances between the rotor and stator. Two of the machines were of 300 h.p. capacity, and they worked excellently. Not only so, but they actually started and stopped, hour in, hour out, during the day, automatically. The reason for adopting synchronous induction motors for air compressor driving, which called for starting and stopping every now and then, was that the power factor at starting was very low. The largest machine at Dundee was of 650 h.p., supplied at high voltage switched on direct, and gave no trouble whatever through high voltage at starting. The circuit resistances were never broken, but the contactors were switched on in rotation, and then when the moment of synchronising came the contactors were all tripped out in series and the exciter switched on with the resistance in parallel with it, but the extra voltage was about 30 volts, and the whole resistance in parallel with the starter was comparatively high, so that there was only about one per cent. of the starting current passing through its windings, which was negligible. In any case, it would only be momentary, and with the gear enclosed there was really no danger.

Mr. H. A. McGuffie was interested from the point of view of the consumer, and spoke of power-factor improvement by means of the static condenser. Probably he was biased in favour of it, being one of the first to make use of it, and the results obtained had been entirely satisfactory for fifteen years. He would never again consider synchronous motors if static condensers could be used. Points in favour of the static condenser were absence of trouble and simplicity of operation; it should be considered by engineers more than it had been in this country.

Mr. W. J. Cooper was of the opinion that there was a very great field for synchronous motors, particularly in the coal areas. It should be quite possible to co-ordinate the operations of ventilating and pumping in such a way that it would be possible to use large synchronous motors, but if consumers were to be encouraged to do that, power companies would require to find some way of giving rebates for leading power factor, and where large capital expenditure was necessary some system of special treatment would require to be devised.

Mr. L. H. A. Carr could only say in reply to the remarks as to the superiority of static condensers, that in cases which he had personally worked out the synchronous induction motor was cheaper to install than the combination of an ordinary induction motor and static condenser. The difficulty of getting consumers to install power-factor correcting devices, because of their capital cost, Mr. Carr thought, was entirely a question of the tariff. The extra capital cost for the synchronous induction motor was of the order of 25 to 40 per cent., which was probably on the high side, as he did not wish to be accused of exaggerating the merits of the machine. Mr. Carr did not share Mr. Baddeley's good opinion of the Oerlikon patents, and stated that motors built on that system showed extremely bad balance, especially at starting; the gain on ordinary loads was not great.

**Electric Meter Film.**—The new motion-picture film, "The Story of an Electric Meter," produced under the direction of the U.S. Department of Commerce in co-operation with the Sangamo Electric Co., of Springfield, Ill., was expected to be ready for distribution by the Department of Commerce on April 1st. The film shows, in a graphic way, the steps in the manufacture of an electric meter, as well as its many uses. A feature of the film will be the animated drawings showing complete operation of the meter itself. This is the first film to be produced under the direction of the U.S. Department of Commerce, in co-operation with American industries, for the purpose of promoting foreign trade abroad and for educational uses throughout the United States. It will be given the widest possible circulation by the Government.—*Commerce Reports.*

# PROTECTIVE APPARATUS FOR TURBO-GENERATORS.

By J. A. KUYSER, M.I.E.E.

*(Abstract of paper read before the* Institution of Electrical Engineers.)

The paper deals briefly with the causes of breakdowns in turbo-alternators, particularly in the stator winding, and discusses means of limiting damage when they do occur. In this connection, to avoid the serious objection to wet- and dry-air filters, an air-cooling system has been developed and so arranged that the air-circulating system is completely closed on itself; thus, the only dirt that can be deposited in the machine is that contained in the original volume of air which fills the air-circulating system, and this amount is entirely negligible. Fig. 1 shows a sectional arrangement of a generator and air-cooler.

The advantages and disadvantages of some of the systems of alternator protection at present in use are pointed out,

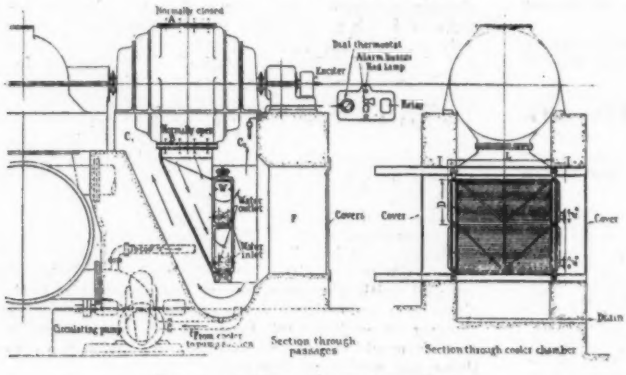


Fig. 1.—A New Air-cooling System.

particularly as regards protection against faults between turns of the same phase winding. The cost of rewinding a 5,000-kW stator is of the order of £1,500, and the loss due to an interruption of several months in the supply may be many times that amount. The cost of complete protective gear as outlined in the paper, including an automatic field switch, is of the order of a few hundred pounds, and, therefore, insignificant compared with its value as an insurance against loss.

A new proposal (by the author and Mr. J. R. Beard) for a protective gear which will operate for all possible faults, including faults between turns, is illustrated in fig. 2. The protected generator A, B, C, D is provided with tappings E, F, G from the mid-point of each phase. Reactance coils (or potential transformers) are connected in parallel with each phase and also provided with mid-point tappings M, N, O. The mid-point of the generator and that of the reactance coils are connected together. Current transformers are inserted in the mid-point connections and their secondaries are connected to the relays.

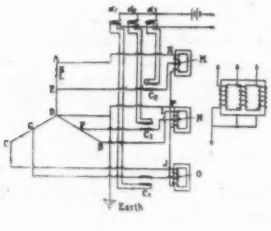


Fig. 2.—Mid-point Protective Gear.

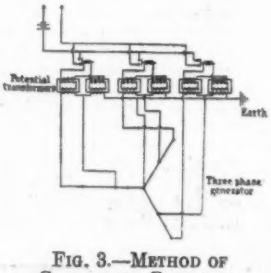


Fig. 3.—Method of Connecting Potential Transformers.

When the machine is in normal operation the interconnected points of generator and resistance are at the same potential and no current will flow in the mid-point connections. If a fault occurs between turns, for example between points K and L (fig. 2), the number of active turns between points A and E will be reduced and at the same time the flux will be weakened by the demagnetising action of the fault currents. Both actions will reduce the voltage between A and E and, to a smaller extent, the voltage in ED. The voltages in AE and DE will therefore be different, whereas the voltage of HM and MP will remain equal, being generated by the same flux. A current will therefore flow in the mid-point connection EM. The voltage and current induced in the mid-point connection is used to operate a tripping relay (by means of a transformer). The unbalancing of the voltages in the phase halves or the shifting of the mid-point in the generator phase winding occurs not only on a fault between turns but also when a fault occurs to earth or between phases. For example, a fault to earth at K (fig. 2) will circulate a large current in KD which will reduce the voltage of DE to a greater extent than the voltage of AE. The same will be the case for a fault from K to any point of the other two phases.

The system will therefore deal with any fault in the generator winding, including faults between turns, and will give more complete protection than has hitherto been obtainable. A fault outside the generator (in the cables leading from the generator) will not cause unbalancing, and the generator leads would therefore not be protected. To include the leads in the protection, the cables can be provided with a conducting shield surrounding the central core and insulated for half the phase voltage from the core and from the armour. This shield is connected to the mid-point at the generator end. The reactance coils in this case are located at the switchboard and their mid-points connected to the shield. A fault from one of the cores to earth must be preceded by a fault from the core to the shield which forms the mid-point connection, and such a fault will operate the gear.

The generator winding has in this system to be provided with three tappings insulated for 50 per cent. of the generator voltage, and three terminals for the mid-point connections, which normally carry no current and can be of very small section. It is not necessary to bring out the 6-phase leads as in other systems; the star point can be made in the stator winding and the generator therefore requires only four main leads and three small pilot leads.

Instead of installing separate reactance coils the potential transformers which are usually required in connection with the voltmeters and wattmeters can be provided with tappings and used for the protective gear. A convenient arrangement is shown in fig. 3. Two potential transformers are required per phase, the secondaries of which are connected in opposition in series with the relay. Special secondary windings are provided for the instruments. As regards the sensitivity and the operation for faults to earth near the star point, this gear is similar to the self-balancing gear in so far as no operation is to be feared for heavy overloads and the relays can be set to their maximum sensitivity. The limitation for dealing with these faults is therefore determined only by the sensitivity of the relays, the impedance of the reactance coils, and the amount of resistance between the neutral point and earth.

A simplification can be made in the case of a generator where the phases are wound in two parallel circuits (fig. 4). In this

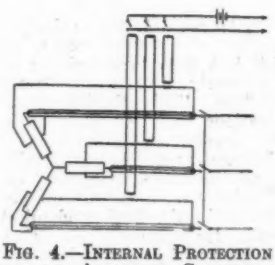

Fig. 4.—Internal Protection for a.c. Apparatus Connected in two Parallel Circuits.

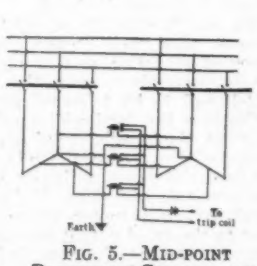


Fig. 5.—Mid-point Protective Gear for two Alternators in Parallel.

case the mid-points of the two parallel windings can be interconnected over the transformer which operates the relay. This system is very limited in its application.

Fig. 5 shows an application of the mid-point protective gear for two a.c. generators running in parallel. This arrangement has the disadvantage that two machines are tripped out when a fault occurs. The sound machine would, however, be immediately ready for synchronising. The great advantage of the arrangement is that extremely little gear is required, *i.e.*, only three current transformers and relays for each pair of generators.

A complete generator protective equipment should include an automatic field switch to interrupt the field circuit imme-

diately the fault occurs. This field switch, so far as the protection of the generator is concerned, is as important as, if not more important than, the main switch.

The phenomena occurring when the field circuit is opened have been investigated, and it is shown that it is possible to open the main field circuit without the use of any discharge resistance. Different methods at present in use to open the main, or exciter, field unnecessarily prolong the discharge of the field and the destructive effect of the fault currents. It is, therefore, recommended that a simple circuit breaker without any discharge resistance, and operated directly by the fault-current relays, be provided in the main field circuit, fig. 6, although there would not be much to choose between tripping the switch as indicated above, or by means of an auxiliary switch on the main a.c. circuit breaker, or by the

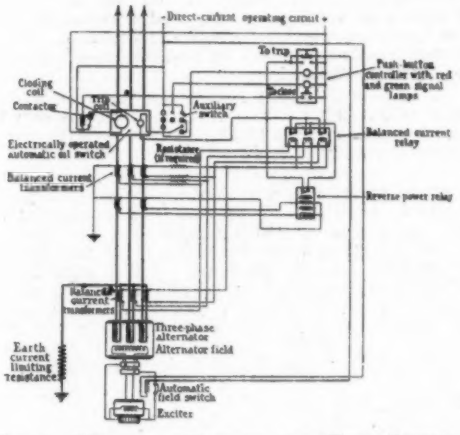


Fig. 6.—Method of Tripping Auto-Field Switch.

combination of both methods, if the main breaker is very quick-acting and is periodically tested to eliminate all possibility of "sticking."

If serious damage is to be prevented, fire extinguishing must be done immediately after the accident and preferably automatically by the action of the fault-current relays, and an extinguisher must be used which will not ruin the insulation. It is sound practice to provide air dampers in the air inlet and outlet, which are automatically closed by means of solenoids energised from the protective relays.

Fig. 7 shows the arrangement adopted for a 15,000-kW set. A point which requires attention on these dampers is the leakage, as the volume of air normally circulating is so large that even a small part of it is sufficient to sustain a fire which has been well started. As soon as the dampers are closed the air pressure generated by the fans rises considerably. The dampers must therefore be made to fit well; also the generator casing and end guards should be designed for as small clearances as possible. It is highly probable that many air dampers, particularly in the case of large machines, would fail to extinguish a fire on account of excessive leakage.

Another advantage of dampers in the air ducts is that the air circulation can be positively stopped while the generator is not in operation, thus preventing condensation of humidity due to the natural draught in the building. Such condensation may also take place when a cold machine is started up and the air temperature is above the temperature of the machine. When this condition occurs it is advisable to leave the dampers closed until the generator has attained a temperature above that of the cooling air. In addition to the use of air dampers, the provision of pipes inside the end bells, through which steam may be turned upon the windings, is being employed, more particularly on the Continent and in the United States, and seems to give good results.

The author is of opinion that a system of steam pipes can be recommended. The only doubtful point is the influence of the hot steam on the insulation. It is not likely that the condensed steam can penetrate very far into the interior of the insulated windings, and a thorough drying-out after the application should remove all moisture. The temperature of the steam cannot rise above 100 deg. C. after expansion through the nozzles, and therefore cannot harm the insulation. Arrangements should be made to prevent any steam leaking past the inlet valve during normal operation. It is not advisable to operate the steam valves automatically from the Merz-Price relays. It would be possible to install thermo-electric relays in the generator to operate the valves; however, there is still a possibility that the steam jets may be operated by an accidental closing of the relays. Steam is likely to do less damage to the generator than is water. The difficulties of extinguishing fire are practically eliminated when the circulating system is used, as the amount of air available for sustaining the combustion is limited. Damage due to the electric arc would, however, continue until the field was "killed," and the generator disconnected from other running machines.

The possibility of preventing extensive damage in the event of a fault occurring in a generator winding depends largely upon the speed with which the main circuit breaker can be opened, and the voltage reduced at the generator terminals.

A complete protective system for a turbo-generator set would consist of the following: Balanced protective gear; inlet and outlet air dampers; automatic cut-off valve on turbine, and vacuum breaker on condenser; main circuit breaker and field switch; steam pipes inside the end bells. All, with the exception of the steam supply to the end bells, could, without risk to the plant, be made to operate automatically upon the occurrence of a fault in the generator. It is questionable whether the complete protective system outlined above is necessary, as a fire can usually be prevented if the main field is "killed" instantaneously.

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### Discussion in London.

The paper was read and discussed in London on April 27th.

The President (Mr. J. S. Highfield) suggested that it would be useful in such papers to be told the value of the apparatus which the protective device had to protect. There was the possibility of a frightful amount of damage, loss, and annoyance on account of the lack of an effective protective gear.

Dr. S. Parker Smith had no sympathy with the paper on general lines, because it ought to be possible to design machines in such a way that they did not require protection against external faults. It ought to be possible to "short" the terminals without injuring the machine, and unless that could be done they could not say they had reached the stage of perfection towards which they were undoubtedly moving. In the better mechanical design of alternators was involved the question of what they were prepared to pay for greater reliability, and the same applied to protection against internal faults; a great deal could be done to prevent the destruction of machines through faults occurring, by paying greater attention to the mechanical details. He had not very much faith in the proposal mentioned in the paper of breaking the field quickly, as cutting off the field current did not destroy the field, and it was the existence of the field that would cause the damage once the short-circuit had started. It was the wrong policy to rely on cutting off the field current as sufficient protection until there was more evidence of the time taken by the flux to die away.

Major Kenelm Edgcumbe said the most interesting point to him was the smallness of the voltage when the field was broken, and the author seemed to think he had done his job when he had reduced the current to zero. That, however, was not really so, and what he wanted to know was the amount of heat which the flux remaining in the alternator after the field current had been broken, would generate.

Mr. H. W. Clothier said that notwithstanding what had been said by Dr. Parker Smith, the evidence in the paper was so convincing that users could not afford to ignore the study of automatic protective devices. At the same time he contended that no serious case had been proved against the 15-year-old Merz-Price balance system, or the five-year-old self-

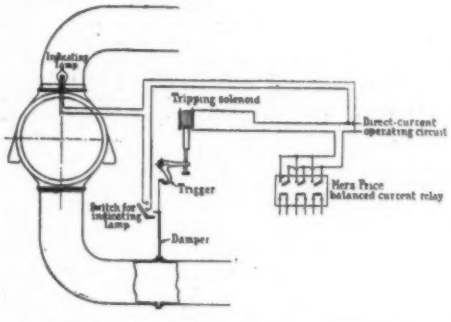


Fig. 7.—Generator Cooling-air Damper.

balance system, although he agreed that the author's new mid-point, or between turns, system should be given a trial. His company had equipped a machine on that method, which was shortly to be subjected to a series of short-circuits. The objections to the system, in his opinion, were the potential apparatus, the extra tapping on the stator coils, and the absence of protection for the alternator terminals. All those, however, could be got over satisfactorily by careful design of the detailed parts. The author's proposal to screen the terminals and cable by a mid-point connection to the switchboard mainly depended for its success on a good design of terminal box mounted on the alternator frame, which would combine the high-pressure and mid-point screen conductors, preferably compound filled. There was an alternative, if objection was made on account of the special cable involved, and that would be to use a balanced leakage protection in

addition to the mid-point protection system, consisting of a set of three current transformers mounted on the switchboard and balanced through a pilot wire with a single transformer of the "bar" type threaded over the neutral conductor of the alternator. There was room for the alternator and the switchgear builders to co-operate.

Mr. A. D. SLOAN agreed with Prof. Parker Smith that protective devices were only temporary expedients.

Mr. H. BRAZIL was staggered by the number of potential transformers in the author's new system of protection. They were things which users of large generating sets were always trying to avoid, and constituted a very grave objection to the system. It was necessary to get back to simplicity.

Mr. L. M. JOCKEL said that the author's system was very complicated when looked at from the operating engineer's standpoint, and he doubted whether many operating engineers would care to tackle it until it had been further tested in practice. He did not think many operating engineers would countenance a system such as that shown in the author's fig. 6, as it seemed to him to be totally bad from the reliability point of view, and it also had several other disadvantages of a theoretical nature. His experience had been that the less potential apparatus they had in the station the safer he felt and, generally, he held the view that there was too much tendency to place the onus on the apparatus and lessen the responsibility of the personal element. Finally, Mr. Jockel suggested the possibility of using indicating lamps in connection with the air washer dampers, and carbon dioxide gas for injection into the ventilating system instead of air.

Mr. L. ANDREWS said that it was necessary for the generator and switchgear makers to work in parallel with the object of tackling the question as one engineering proposition.

Mr. E. T. WILLIAMS urged designers to look at the matter more from the operator's point of view than was usually the case. His experience was that the troubles involved by the protective apparatus were greater than the troubles they were put in to prevent. Greater reliability of the main plant was required, and he would think twice before he advocated anything of the nature suggested by the author's new system for the protection of an alternator.

Owing to the lateness of the hour the author intimated his intention of giving his full reply in writing.

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### DISCUSSION AT NEWCASTLE.

AT the NORTH-EASTERN CENTRE of the INSTITUTION OF ELECTRICAL ENGINEERS Mr. J. A. Kuyser read his paper on March 27th, and during the discussion that followed

Mr. C. H. DAVIDSON congratulated the author on being privileged to publish the results of the work he had been engaged on for the last eighteen months. The curves shown confirmed what had been deduced from theory. The great need was for the opening of the neutral switch, for if that were done automatically by the protective arrangements it would prevent serious burning of the core when faults to earth occurred. In dealing with the closed-air-circuit system the author referred to the difficulty occasioned by the bringing in of moisture by leakage air, but if the ducts were all inside the engine-room Mr. Davidson could not understand why much moisture should be deposited. Concerning the application of mid-point protective gear to two alternators, the disadvantage of that particular arrangement was that two machines would be tripped in case of a fault, and it would probably take some time to discover which of the two was the faulty alternator. Recently it took the best part of a day to find out why a machine had tripped, and the breakdown was only discovered when the rotor was taken out. It appeared as if in the arrangements described by the author a device should be incorporated to indicate the faulty machine. The curves which showed what happened when a field was broken confirmed the speaker's view that the fields of modern high-speed machines could not be killed instantaneously. The object of breaking the field without a discharge resistance was to reduce the a.c. voltage as quickly as possible, and it was obvious that to enable this to be done the minimum amount of damping should be allowed in the rotor, consistent with limiting the voltage rise in the field windings to a reasonable figure. Why should there be any advantage in tripping the auto-field switch direct from the fault-current relays rather than from an auxiliary switch on the main a.c. breakers? It was almost unknown for a modern switch to stick, and if it did he failed to see what advantage would be gained by opening the field breaker alone.

Mr. H. W. CLOTHIER said the author had remarked that during the past two or three years advances had been made in the protection of turbo-generators, but he asked whether the position was not rather that in the past the persons responsible for the protection of alternators had not properly appreciated the need for the use of such protective gear, but were just awakening to the fact in the period the author named? As a matter of fact such systems had been used, and had been open for use, for almost fifteen years. The use of a field switch in the exciter circuit was not sufficient to cut out the amount of damage. Insurance companies would be very much interested in the paper. About four years ago mid-point protection was first mentioned to him as a possibility, and they went on with a view of taking out specifications, but found that Mr. Kuyser had anticipated them by about two months. The term "mid-point" could be more properly described as "between-turn" protection; actually it might not be "mid-point," it was a balance between two parts of the alternator winding. Some objection might be made to the system because it meant bringing out another point in the alternator winding.

Mr. J. ROSEN referred to the statement that breakdowns had not been traced to excessive temperature rises, and said his experience was, and he would say it most definitely, that excessive temperature rises, no matter what the material, had caused a large number of breakdowns, and they could take it that the higher the temperature rise was the shorter would be the life of the alternator, but sometimes they found it impossible to trace the cause of the trouble because the whole thing was completely burned out. As to the enclosed system of ventilation, they had a cooler in use for three of four years which gave entire satisfaction. He would like to see greater care taken to prevent breakdowns rather than to limit the damage.

Mr. G. L. PORTER thought protection between the turns was an excellent thing. The alternator was the only thing they had that was liable to break down between the turns, for transformers failed very seldom.

Mr. J. W. TOWNELEY referred to temperature rise, and said the author's observations were contrary to his (the speaker's) experience in most cases. In some cases machines would run for a long time at a high temperature, but then they failed perhaps through the deterioration of the insulation, and broke down between the turns. If they exceeded a certain temperature they had to be prepared for a relatively short life. The use of delicate protecting devices appealed to one in different ways depending on the size of the station. A defect in some of the complicated protective gear might cause a shut-down which would have been avoided if they had not had the gear. The enclosed system of ventilation and air-cooling had been done very successfully, and the troubles were obvious. They had adopted another system which they had found very satisfactory, viz., the use of cocoanut matting for filters, and they found that after running a 5,000-kW alternator regularly for two years the amount of dirt that had not been removed was quite within what might be called reasonable limits, and was insufficient to cause trouble.

The author replied briefly to the points raised.

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### DISCUSSION AT LEEDS.

AT the NORTH MIDLAND CENTRE of the INSTITUTION OF ELECTRICAL ENGINEERS, on March 28th, Mr. Spurr (Bradford) presided over a good attendance when Mr. J. A. Kuyser read his paper.

In opening the discussion the CHAIRMAN said that as far as they were concerned in Bradford all their alternators were protected on the system shown in the paper as the Merz-Price current balance. It was quite evident, from the oscillograph records which had been exhibited, that they could do away with the full breaking resistance. It seemed quite possible that it was taking up their time, and there was no doubt they should be able to have the fault current done away with altogether. The mid-point protective gear appeared to be a little complicated. Temperature had been the cause of some failures. With regard to the protection of a 3-phase generator by the Merz-Price (balanced-current) system, if there was anything wrong with the gear they could not use the machine; in that way it was self-protective. They had to get the fault cleared, or cut out—one of its great points which he had not seen mentioned. With regard to fire protection, a point worthy of attention was that they got a lot of dirt on the windings, even through air filters. It was some people's practice to remove the end covers and spray the windings with paint or varnish to keep a good surface. With regard to static discharge, the recommendation that the stator be entirely recleaned and varnished was a complete cure. In Bradford they had steam jets on the large machines for fire protection. If they could turn on the steam at the same time as they tripped the oil switch they might have some effective result.

Mr. CARTER observed that he had experienced the failure of the field of a 1,500-kW 160-r.p.m. Westinghouse 25-cycle alternator running in parallel with 10,000 kW of plant—two turbines and seven smaller machines. Rather to their surprise nothing happened. The machine ran on in parallel, and after perhaps 15 or 20 seconds the field switch was again closed. It kept up the load, and everything went steadily. In another case probably 10,000 kW of alternating-current, 25-cycle plant, and somewhere in the neighbourhood of 8,000 kW of direct-current plant was running, the two were tied together without any trip gear with the exception of alleged failing-feed trips on the alternators and reverse trips. Owing to a mistake in the switching the excitation was cut off the main exciter, which excited all the alternators. The d.c. and a.c. bars were to a certain extent in parallel through a matter of 3,000 kW of converting plant; some of the

motor generators were up to three miles away from the power house. The result of that failure of the field was what amounted almost to a short circuit. The d.c. generators pumped a heavy current by the rotary converters into the a.c. machine. From the moment of the fault to the time they were running back steadily on the busbars was only nine minutes, and no damage took place, but the alternators came out of parallel, and each one had to be re-synchronised. The thing he wanted to point out was that, under certain conditions, notwithstanding a failure of field, the switches remained in, and they did not get currents which were enormous.

In replying to points raised, Mr. J. A. Kuyser said it was gratifying to know that Mr. Spurr's experience confirmed in general what was set forth in the paper. They hoped that they had now cured the complete burn-out by the protective gear which they were putting in. They had tested the mid-point gear in the factory upon a generator and the sensitivity was very high; he was also sure it would not operate in the case of a short circuit. One machine was now in operation with the mid-point gear under actual operating conditions, and it had been running satisfactorily for some time. Extended trial under actual conditions was the only way to test controversial points. To bring the tappings outside of the generator winding would not be very difficult. If they used the mid-point gear it was not necessary to have six terminals in the way required in the case of the Merz-Price gear, or self-balancing gear. It was not necessary to bring out the two ends of each winding; they needed to break up the terminal and three mid-points; that was seven leads in all, which could be made as heavy as the main leads. It would have to be found out in practice whether the complications were worse than others. The mid-point connections themselves could hardly be considered a complication; there were objections in connection with potential transformers. They were already provided on a variety of machines, and in such cases there was not much extra complication. By some it might be considered a disadvantage (if a fault developed in the potential transformer) to shut the whole machine down and interrupt the supply for a time. Potential transformers were fairly reliable if they were not made too small. There was a large percentage of machines in which it was possible to use one bar per slot and thus avoid faults. Bradford was one of the few cases where steam pipes had been installed on the generators. He knew of a case where static discharge returned to earth on end connections every time the layer of dirt was broken, and at all the places where the layer was broken small sparks occurred between the adjacent layers. Mr. Carter had confirmed some of the points made in the paper. Regarding the interchange of current between the machines, if they tripped the field in one machine the question whether heavy or small current flowed depended on the design of the machine. Whilst the magnetising current was low the whole current would be small. That it was possible to run on, and that the machine dropped into stride again, did not always happen; he knew it happened in the case of turbo-alternators. They had tried all kinds of wet filters, but had not found a single type which was really satisfactory. The closed-air system was running very satisfactorily, but one thing which must be guarded against was the leakage of the air. It would still carry over a certain amount of moisture and dirt which would be deposited. That was a point which could easily be dealt with. With regard to the type of filter which amounted to a lot of scrap dipped in oil or some other sticky substance which would hold the dust and dirt out of the air, he could not say definitely yet whether it was satisfactory or not, but he thought there was a market for a filter of that type in spite of the closed-air circulating system which was not always applicable.

## INTERNATIONAL CO-OPERATION OF ENGINEERING INSTITUTIONS.

At a meeting of the British Section of the Société des Ingénieurs-Civils de France, held at the Institution of Mechanical Engineers, London, on April 11th, Mr. W. Noble Twelvetrees delivered his presidential address, the subject of which was "Co-operation Between Engineering Institutions in France and Great Britain."

After dealing with the history and work of the French Society, Mr. Twelvetrees said the essential objects of the British Section were: (1) to provide for the establishment of closer relations between members resident in different parts of Great Britain and the British Empire; and (2) to encourage professional and friendly intercourse between French and British engineers generally. At the first meeting of the British Section, under the presidency of Mr. C. H. Wordingham, it was pointed out that the Section might conduce materially to the attainment of the second of these objects by drawing into the ranks of the French Society as many members as possible of the engineering institutions and societies of this country, and by working, at the same time, for the recruiting of French engineers as members of British engineering institutions. The first of these suggestions had met with a most promising response, for the membership of the Section, which was doubled by the end of 1920, was now approximately three times that existing at the date when the Section was formed. The second suggestion that French engineers should be invited to offer themselves for membership of British institutions, was one that the Section would gladly attempt if the idea were approved by the Institutions concerned. There was one obstacle which had in the past prevented many young French engineers from joining British institutions, namely, that the qualifications for associate-membership usually included the passing of examinations, or the possession of an approved diploma or certificate exempting candidates from examination. In view of these requirements it seemed desirable that the equivalence of French and British engineering diplomas and certificates should be determined, with the object of preparing a list of French qualifications which would be accepted by British engineering institutions, in every case with due regard to special requirements, as exempting candidates wholly or in part from the examinations prescribed. The British section consisted exclusively of engineers who had been elected members of the parent society, all such becoming and remaining members of the Section while resident in the British Empire, without any formality or financial responsibility. Incidentally, it was mentioned that arrangements had been made with engineering firms in Lorraine to accept a few British engineering students for periods of three months during the summer, so that some experience might be gained of French engineering practice.

In conclusion, Mr. Twelvetrees said that once the engineering institutions on both sides of the Channel were effectively organised, the next step should be the formation of a Franco-British Committee, whose special business it would be to consider all possible means of bringing into closer touch the engineers of the two nations, and the scheme could well be spread to other countries on the same lines. Incidentally, he mentioned that an American Section of the French Society had been formed.

Contrary to the usual practice, the address was thrown open to discussion. Several speakers took part, and all of them heartily welcomed the scheme of federation, both as between engineering institutions in the individual countries, and also as between the federated bodies of different countries.

Mr. C. H. Wordingham, speaking on the question of the federation of engineering institutions in this country, said it must be admitted that there were serious difficulties in the way of producing a workable scheme, mainly owing to the jealousies and opposition of the smaller societies, which felt that they ought not to be left out. Personally, he agreed that they should not be left out, but it was not practicable that all of them should be represented on a central body directly. He suggested, therefore, that it might be possible to group these smaller societies together so far as they dealt with a particular branch of engineering, and then federate the groups under the main institution representing that branch. The main institutions then could be federated together in the Grand Council of the whole engineering body of this country. In that way he believed it would be possible to federate all the societies together and avoid the jealousies which would otherwise be destructive of the practical carrying out of the scheme.

Captain H. Riall Sankey said that the conference between the Institutions of Civil, Mechanical, and Electrical Engineers, and Naval Architects, which had been referred to, had made progress, and it would not be long before details of a scheme would be published. The difficulties were, no doubt, with the smaller institutions, but that matter had also been considered.

Mr. W. H. Patchell, whilst upholding the principle of federation, did not think that in this country they could get anything approaching the federation that existed in America, which would be altogether too unwieldy for us, and he believed it would soon be too unwieldy for America, because they were, in America, trenching on politics and doing things which we dared not do at all in this country. He believed the tendency in all countries in future would be for the engineering institutions to pay more attention to men than to materials. The old definition was to consider materials first, but in future we should have to consider the men, and the materials would follow.

Mr. E. Fiander Etchells, whilst an advocate of closer union amongst engineers, thought the difficulties were so great that he, personally, would prefer not to undertake the work required. He looked to the "Civils" to be the leaders in this movement for federation, and the existence of specialised institutions would, in his opinion, strengthen the position of the Institution of Civil Engineers. Despite delays and setbacks, he firmly believed we were moving forward in the direction which had been discussed.

**A Population Map.**—The Dorland Agency, Ltd., has sent us a copy of a map of the British Isles, in which the density of population in various parts and zones is indicated. It is thought that this may be of assistance to readers interested in advertising and selling goods. The Agency supplies the map, properly packed, at 1s. 3d. post free.

# NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

*Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.*

### "Carron" Boiling Rings and Plates.

As mentioned recently, in connection with the Hackney electrical exhibition, CARRON Co., Falkirk, N.B., has introduced a range of three electric boiling rings (fig. 1). These are of the open-coil type, the elements being laid in a fireclay

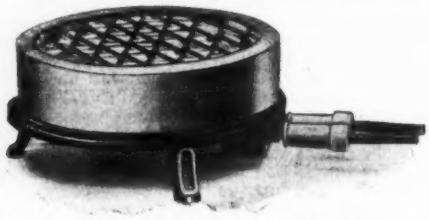

FIG. 1.—"CARRON" OPEN-COIL BOILING RING.

former. The base is of cast iron, and the upper frame is nickel-plated. Two separate porcelain metal-sheathed connectors are provided in the case of two of these rings; the third is provided with three, arranged for three-heat control. The rings are in two sizes, 6 in. and 8 in. diameter, with loadings of 750 and 1,250 W respectively.

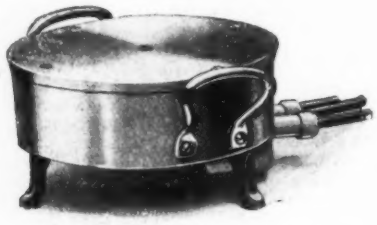

FIG. 2.—"CARRON" SOLID-TYPE BOILING PLATE.

Solid-type boiling plates (fig. 2) of similar sizes and loadings have also been introduced. These have cast-iron tops, nickel-plated casing, brass nickel-plated side handles, and sheet-iron bases.

### A Chain Intake Screen.

We have received from Mr. E. C. BARTON particulars of a simple and ingenious intake screen which he noticed recently at the La Tine electricity works, in Switzerland. As shown in fig. 3, it consists of chains running over guides A B and K M, driven by a rotating drum D, and trailing on the floor of the water duct; the chains are composed of links L (fig. 4) with pivoted flaps, each flap consisting of a frame filled with netting. As the chain passes over the drum, the flaps, shown at F in fig. 5 fall violently on the guide G, thus shaking off the dirt and *débris* which they have collected, the rubbish falling into a gutter R and being carried off by a stream of water. Fig. 4 is a detail view of the drum and chain. The flaps F have lips S, which scrape along the floor of the duct and pick up stones and sand, which are deposited in the gutter.

The whole screen is guided only from A to B and from K to M. Its excellent self-cleaning property and the simplicity of the whole contrivance are strong points in its favour. It will be noticed also that the screen scrapes along the floor of the duct, removing sand and mud, and keeping it clean, whilst sealing the passage without the use of a bottom roller.

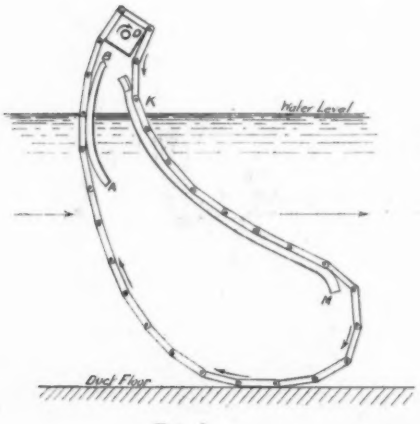


FIG. 3.

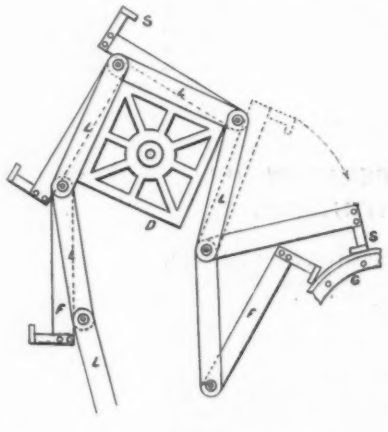


FIG. 4.

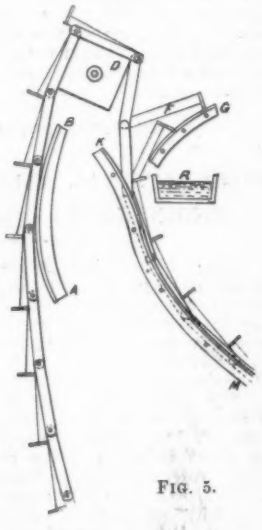


FIG. 5.

A CHAIN INTAKE SCREEN.

### Unit Type Cable Racks.

A convenient form of cable rack has been placed on the market by CALLENDER'S CABLE & CONSTRUCTION CO., LTD., Hamilton House, Victoria Embankment, E.C.4. This consists of a back plate, which can be fixed to a wall or other structure,

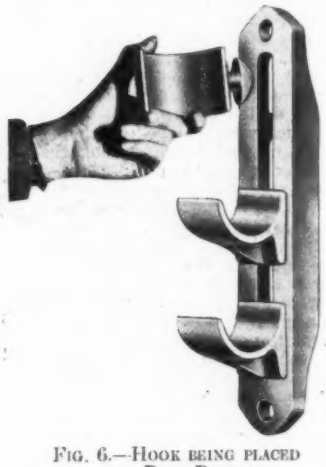

FIG. 6.—HOOK BEING PLACED IN BACK PLATE.

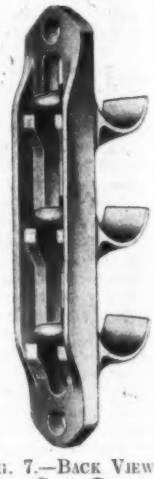

FIG. 7.—BACK VIEW OF CABLE RACK.

and removable hooks. Our illustration show (fig. 6) the insertion of a hook, and (fig. 7) the back of the rack with hooks in position. The rack is made in several sizes, for accommodating from two to six cables of sizes ranging from 1¼ in., or below, to 3 in. in overall diameter.

### The "Hydrotherm" Water Heater.

A compact form of instantaneous water heater has been placed on the market by MR. A. W. C. FROST, Alderman's House, Bishopsgate, E.C.2. This device (illustrated in fig. 8) is arranged to fit directly upon a water-supply pipe, taking the place of an ordinary tap, and it combines both the functions of a tap and of a heater. When the handle seen in the illustration is at the position marked "0" water passes into the apparatus. Upon moving the handle to "1" cold water is released. At "2" the current is switched on, and the flowing water is raised to a temperature of 86 deg. F. Between points "2" and "3" the temperature is gradually

raised to a maximum of 192 deg. F. If the handle is turned beyond "3" the energy is immediately switched off, and between "3" and "0" cold water issues, the flow being

Fig. 8.—The "Hydrotherm" Water Heater.

stopped at "0." The device is arranged for any voltage and for d.c. or a.c.

## THE GRADING OF POWDERS.

The Faraday Society and the Oil and Chemists' Colour Association held two joint meetings during March, at which were discussed some of the properties of powders that are of industrial interest, and more particularly the various means that are or could be employed for their separation and grading. The Societies joined forces in order that the subject might be considered from various aspects, and the theme proved to be of much greater interest and variety than might have been imagined from the title. The principal contributions were made by Prof. T. M. Lowry, who dealt with grading by elutriation; Prof. P. G. H. Boswell who, speaking from the geologist's standpoint, discussed the separation of the finer constituents of sedimentary rocks; Dr. J. W. French, who spoke of the abrasives and powders used for grinding and polishing glass; Mr. O. A. Klein, who dealt with the grading of pigments; Mr. B. A. Keen, who brought in the treatment of soils by grading for study of their physico-chemical properties; and Mr. R. Whymper, whose subject was elutriation as practised in the separation of cacao husk from cocoa powder. In addition, theoretical contributions were made by Prof. Alfred W. Porter and Dr. A. T. Williams; while Dr. R. Lessing indicated applications in the cleaning of coal, a process largely dependent on elutriation methods; and Mr. Holman spoke on ore-dressing. The treatment of the subject, therefore, did not lack variety. We can here only summarise very briefly the outstanding features of the various contributions.

Prof. Lowry's paper described experiments made by him and Mr. L. P. McHatton to determine empirically the laws which govern grading by elutriation, or, in other words, the separation of fine from coarse particles by means of flowing water. This method has not up to the present been largely used in large-scale operations, but it is invaluable on the small scale and notably for testing and laboratory purposes. The most satisfactory method of elutriation was found to be in the use of a long vertical tube through which water flowed with a known velocity, and several series of measurements were made in this way, in which the maximum and minimum diameters of the particles were determined in the fractions carried away by a current of water flowing at 4, 5, 6, 7, and 8 mm. per second. The powders used were ground quartz and ground barytes, and empirical results were obtained, which may be of general application, given the proper constants in all instances, showing the influence of the diameter of the tube and the temperature of the water for powders of different densities. The importance of the matter lies in the necessity for standardising methods of grading as a preliminary to the scientific study of the effect of the size of the particles in materials used in the powdered form, such as cements, refractories, ores, paints, drugs, foodstuffs, and so forth. At present chaos seems to rule in these matters, and the extent to which grinding is carried is determined frequently by the crudest of rule-of-thumb methods.

To the geologist, Professor Boswell stated, powders have a double interest, "pure" and "applied." He may be concerned with the finer sedimentary rocks and problems regarding their origin and desire to establish a description of them on a quantitative basis; or with the fine grinding of geological materials, such as abrasives (quartz, felspar, flint, &c.), stones, pottery-slips, brick and tile-making earths, soils, and so forth. Much of Prof. Boswell's paper dealt with the application and the limitations of Stokes's Law on the fall of small spheres in a viscous medium to the special case of the elutriation and subsidence of clays, and a modified form of the law was given. He also indicated standard conditions suitable to be applied in the mechanical analysis of sediments.

Dr. French, in his paper on abrasives, stated that it was necessary to know the principles of abrasion before one could predict with certainty the abrasive qualities of a material and the best conditions of working. His interesting paper, therefore, was chiefly a study of the process of abrasion, based on experiments made with grains of a definite size, for example, steel shot. It was laid down that the rate of abrasion depends on the size of the grains; the force of impact which itself depends on the load on the tool, its speed of translation and its grip on the grains; and the number of impacts per unit time. Finally, the process of polishing was described and contrasted with grinding. It was concluded that polishing action is essentially physical, and not chemical, and that in the case of glass the conceptions of Sir George Beilby, derived from work on metals, on the formation of a surface amorphous layer which flows over the cavities beneath, do not necessarily apply.

## SOME POST-WAR PROBLEMS OF TRANSPORT.

James Forrest Lecture.

On May 2nd, at the Institution of Civil Engineers, Sir John A. F. Aspinall delivered the above lecture to a fairly large audience. The speaker drew attention to the enormous increase in the growth of traffic which had taken place during and since the war, and pointed out that the outward movement of suburban traffic had forced the railway companies to institute special arrangements on the main lines to deal with the problem. The underground railways of London were endeavouring to provide every facility for suburban passengers, but there still remained a great deal to be done in the way of extension and improvement of services. The problem of loading was a difficult one, but it might be met by the provision of more stations or by the use of three platforms instead of two at existing stations; the central platform would be used for outgoing passengers only. Tubes below those already constructed had been suggested for fast through trains. Sir John Aspinall exhibited on the screen several diagrams made by the Board of Trade to show the density, origin, &c., of London traffic. It was shown that the north-west and south-west districts required greater facilities for travel. The density in the east was the greatest, and the brunt of this was borne by the steam railway termini. The magnitude of road traffic was also shown by a diagram, and the speaker gave details of the vast amount of work being done by the motor omnibuses. He thought that the improvements in these services and the rigidity of tramways would militate against any considerable extension of the latter. Many schemes had been put forward for dealing with London traffic, but in most cases they had proved failures, principally due to the working of our Private Bill legislation. The present piecemeal developments would never provide a satisfactory solution to the question of London transport. The speaker urged the institution of a committee of competent men with a knowledge of public requirements, to formulate new schemes and co-ordinate existing systems. The amount of traffic dealt with by the Thames bridges was illustrated in a third diagram. This clearly showed the necessity for another bridge to relieve that at Blackfriars. Sir John also dealt with a suggestion for the improvement of Charing Cross bridge, by making it a double-deck structure. The railway would remain at the present level, but another bridge for road traffic would be constructed above it. The station would be re-built at a lower level, and be used mainly for local traffic. Under the grouping of the southern railways it would appear desirable to make Waterloo the terminus for all main-line traffic. The L. & S.W. and S.E. & C. Railways already had stations there, and a loop could be constructed to enable the L.B. & S.C. Railway traffic to terminate there.

The speaker thought that the grouping of railways would result in great economy in working costs. In this connection he exhibited two diagrams which showed the apportionment of expenditure of the railway companies both before and after the war. The greatest proportional increase was shown in the cost of labour. The main problem before railway engineers was the reduction of working costs, and there was no doubt that this would be achieved by electrification. The electrification of lines would result in practically doubling their carrying capacity. As an example of successful electrification, the speaker instanced the Chicago, Milwaukee and St. Paul Railway, upon which a journey of 440 miles was performed by one locomotive. This increase in capacity would permit the postponement of heavy capital expenditure upon widening and other improvements which the retention of steam locomotion would involve. Sir John referred his audience to Sir Vincent R. Hill's recent paper upon railway electrification. He claimed that the acceptance of a standard system by the Committee appointed to deal with the subject had swept away one important objection to electrification. British manufacturers were prepared for the work. The electrification of suburban lines was recognised as essential, but there was still a certain amount of hesitation regarding main lines. Sir John thought that there was no reason for postponing work which would benefit alike the workers, the manufacturers, and the public. Other countries had the advantage of large water-powers, but we should have to rely upon coal. However, the co-ordination of electricity undertakings should result in a supply at reasonable prices, facilitating the work of railway electrification. A cheaper supply would also lead to a greater use of electric trolley buses—a very flexible form of locomotion.

## NEW PATENTS APPLIED FOR, 1922.

(NOT YET PUBLISHED.)

**Compiled expressly for this journal by MESSRS. SEPTON-JONES, O'DELL AND STEPHENS, Chartered Patent Agents, 285, High Holborn, London, W.C. 1.**

11,422. "Neutralising capacity currents on polyphase electric transmission systems." A. M. Taylor. April 24th.
11,434. "Ignition devices." F. Jeannin. April 24th.
11,436. "Wireless apparatus." H. L. Crowther and W. H. Derriman and J. Robinson. April 24th.
11,445. "Tramcar." H. J. Aldwinckle. April 24th.
11,456. "Electric switches." C. G. Bennett. April 24th.
11,462. "Voltage transformer for continuous electric currents." F. M. M. de Vaulserre. April 24th. (France, April 27th, 1921.)
11,466. "Selecting systems." Western Electric Co., Ltd. (Western Electric Co., Inc.) April 24th.
11,469. "Sparking plugs." E. C. Homan and A. Taylor. April 24th.
11,475. "Electric connecting devices." O. Ellinger. April 24th. (Germany, April 23rd, 1921.)
11,483. "Electric stop-motions for textile machinery." Hindine Engineering Co. and O. Y. Imray. April 24th.
11,487. "Means for supplying electric current of low voltage from a supply of high voltage." R. Barwinkel. April 24th.
11,503. "Electric furnaces." R. A. Driscoll. April 24th.
11,508. "Device for electro-mechanical lamps for mines, &c." A. Luzy. April 24th. (France, August 4th, 1921.)
11,511. "Incandescent electric lamps." C. V. Smith. April 24th.
11,517. "Portable electric power stand." H. E. Dickerson. April 25th.
11,528. "Electric horns for motor vehicles." R. R. Leggott. April 25th.
11,539. "Electrical connection." A. E. Thurstan. April 25th.
11,552. "Spark plugs." C. Hough. April 25th.
11,582. "Sparking plugs." R. S. Woodruff. April 25th.
11,592. "Electric horns, &c." B. Ames and P. J. Gilinson and Heinze Electric Co. April 25th.
11,600. "Electric heating units." British Thomson-Houston Co., Ltd. (General Electric Co.). April 25th.
11,601. "Means for reducing distortion in repeating systems." Western Electric Co., Ltd. (Western Electric Co., Inc.) April 25th.
11,606. "Receiving, reproducing or reinforcing sound waves." D. C. A. Hultgrom. April 25th.
11,611. "Electric indicating and/or recording mechanism for weighing apparatus." J. Collie (W. Nikolsky). April 25th.
11,613. "Support for mounting electric head lights on automobiles." Fallimento Soc. Anon. Manifattura L. Duca (formerly Soc. Anon. Manifacttura L. Duca). April 25th. (Italy, April 28th, 1921.)
11,617. "Electric safety lamps for mines, &c." V. Pawelecki. April 25th.
11,634. "Manufacture of electrical conductors." W. S. Smith. April 25th.
11,667. "Electric lamps." A. E. Thomas. April 26th.
11,671. "Electric light fittings, &c." S. Coxon and P. Ross and F. M. Soulsby. April 26th.
11,676. "Cooking attachment for electric heaters." A. R. Dow. April 26th.
11,688. "Sparking plugs." D. Young. April 26th.
11,703. "Car-lighting dynamos, &c." P. C. Hanks. April 26th.
11,704. "Electric switches." G. C. Lundberg and A. P. Lundberg and P. A. Lundberg and G. Pegg. April 26th.
11,726. "Electric ovens." W. Bradley and J. H. Williams. April 26th.
11,727. "Induction coils." British Lighting and Ignition Co., Ltd., and E. O. Turner. April 26th.
11,732. "Dynamo electric machines." Sir C. A. Parsons and J. Rosen. April 26th.
11,750. "Electric head lights for automobiles." Fallimento Soc. Anon. Manifattura L. Duca (formerly Soc. Anon. Manifattura L. Duca). April 26th. (Italy, April 28th, 1921.)
11,761. "Wire-stranding or cable-making machines." A. Wood and G. Wood and J. Wood. April 26th.
11,762. "Detachable electric light fittings." E. Isherwood. April 27th.
11,767. "Spherically, chromatically, and astigmatically-corrected telephoto objective." C. Zeiss (firm of). April 27th. (Germany, May 7th, 1921.)
11,770. "Cooling devices for sparking plugs." W. E. Holdom. April 27th.
11,773. "Trolley heads for electric cars." R. Gaskell and W. E. Kerslake. April 27th.
11,775. "Electric tumbler switches." A. C. Wynne. April 27th.
11,797. "Electric alarm switches." G. W. Wacker. April 27th.
11,803. "Putting up platinum contacts for magnetos." W. D. Meagher. April 27th.
11,813. "Electric head lamps for motor-cars, &c." P. G. P. McCulloch and W. E. Marshall. April 27th.
11,817. "Rotary electrical hand switch." A. H. Mollik. April 27th.
11,852. "Insulators for suspended high-tension electric wires." A. Renaudin. April 27th. (France, February 23rd, 1920.)
11,853. "Insulators for suspended high-tension electric wires." A. Renaudin. April 27th. (France, February 23rd, 1920.)
11,868. "Sparking plugs." H. A. Joel and E. W. Riley. April 27th.
11,883. "Magnet poles for commutator machines with compensating windings." L. Torda. April 27th.
11,886. "Apparatus for detecting defective insulator units in a series subjected to a high alternating tension." C. E. Bennett. April 27th. (Spain, April 30th, 1921.)
11,890. "Electric spinning wheel." J. Cutner. April 28th.
11,896. "Dry batteries." G. R. Baynton. April 28th.
11,901. "Electric condensers." W. J. Cole. April 28th.
11,907. "Magnetos for internal-combustion engines." A. K. Gordon. April 28th.
11,908. "Forming armature coils." A. Nicholson. April 28th.
11,931. "Apparatus for distributing electric current." British Insulated and Helsby Cables, Ltd., and G. H. Nisbett. April 28th.
11,945. "Electric burglar-alarm contact." E. Barber. April 28th.
11,962. "Instruments to indicate electrical resistance of circuit in which they are included." Evershed & Vignoles, Ltd., and G. B. Rolfe. April 28th.
11,965. "Burglar-alarm clocks." A. Reuther. April 28th.
11,974. "Sparking plugs." W. F. Burningham. April 28th.
11,975. "Railway signalling systems." Automatic Telephone Manufacturing Co., Ltd., and A. E. Hudd. April 28th.
11,976. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. April 28th. (United States, April 28th, 1921.)
11,977. "Phase-increasing apparatus for supplying current-rectifying devices, &c." Bureau d'Organisation Economique. April 28th. (Germany, April 28th, 1921.)
12,001. "X-ray, &c., tubes." E. E. Burnside and Newton & Wright, Ltd. April 28th.
12,005. "Direction-finding apparatus for wireless telegraphy." C. E. Horton and L. G. Preston. April 28th.
12,013. "Manufacture of cores for mercurial cut-outs." W. H. Illingworth. April 29th.
12,014. "Electric cut-out." W. H. Illingworth. April 29th.
12,015. "Device for locking starting switches of automobiles, &c." G. J. Jackson. April 29th.
12,026. "Miners' safety lamps." E. A. Hailwood. April 29th.
12,047. "Electric plug connectors." W. E. Shore. April 29th.
12,067. "Means for drawing attention to position of switch in ignition circuit of internal-combustion engines." A. G. Benstead and Rotax (Motor Accessories), Ltd. April 29th.
12,069. "Electricity supply apparatus." R. Amberton. April 29th.
12,070. "Electric lamp-holders and switches." N. D. G. Robertson and Wayne Engineering and Equipment Co., Ltd. April 29th.

## PUBLISHED SPECIFICATIONS.

**The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.**

### 1920.

18,998. "Wireless receiving systems." E. H. Armstrong. October 29th, 1913. (147,042.)
28,338. "Automatic telephone pay station." G. A. Long. October 6th, 1920. (178,141.)
28,400. "Automatic valves or switches to secure the more economical use of gas, electricity, steam, hot water, hot air, or the like for heating purposes." G. Wilkinson. October 7th, 1920. (178,143.)
29,089. "Telegraphic transmission of pictures." J. C. Grant. October 14th, 1920. (178,145.)
30,743. "Radio-apparatus." T. Appleby and L. M. Knoll. June 14th, 1913. (153,267.)
31,869. "Dynamo-electric machines." R. Bosch Akt. Ges. June 18th, 1920. (165,059.)

### 1921.

163. "Electrically-conducting strips or bands for recording and reproducing sound waves." R. Mylo. January 2nd, 1920. (156,216.)
306. "Electric railways." Compagnie du Chemin de fer de Paris à Orleans. August 30th, 1917. (156,263.)
324. "Manufacture of coils for electric machines." A. H. Hibbs. January 5th, 1921. (178,174.)
691. "Receivers for electro-magnetic wave systems." H. J. J. M. de Regnauld de Bellescize. October 10th, 1919. (156,680.)
730. "Aircraft for electrically prospecting for minerals or water." H. Lowey. March 27th, 1919. (156,696.)
787. "Electric pocket lamps." A. Luzy. August 4th, 1919. (Addition to 120,027.) (156,726.)
796. "Suction cleaning devices." Apex Electrical Manufacturing Co. September 27th, 1915. (156,735.)
797. "Suction cleaners." Apex Electrical Manufacturing Co. January 17th, 1917. (156,736.)
890. "Cable telegraphy transmitters." F. L. Rogers. May 5th, 1919. (156,803.)
950. "Apparatus for converting and/or transforming electric currents." J. E. Calverley and W. E. Highfield. January 8th, 1921. (178,190.)
1,106. "Arrangements for transmitting signals and articulate speech under water." Signal Ges. December 20th, 1919. (157,232.)
1,328. "Wireless telephone transmitters." Ges. Fur Drahtlose Telegraphie. December 23rd, 1919. (157,407.)
1,362. "Multiple stage amplifiers." J. Massolle, H. Vogt, and Dr. J. Engl. December 2nd, 1919. (157,435.)
1,387. "Electric switch." A. Messer. January 23rd, 1920. (158,234.)
1,406. "Electric discharge tubes." J. Masolle, H. Vogt, and Dr. J. Engl. December 2nd, 1919. (157,706.)
1,435. "Electric motors." British Thomson-Houston Co., Ltd. January 4th, 1918. (157,724.)
1,463. "Electrically-operated glow lamp for the reproduction of acoustic electric frequencies." J. Massolle, Dr. J. Engl, and H. Vogt. March 3rd, 1919. (157,757.)
1,500. "Electrolytic process and apparatus for the separation of platinum from other metals contained in platiniferous materials." E. Slatineau. December 19th, 1919. (157,785.)
1,564. "Electrical connections and switches for enabling an electric current consuming device to be used on circuits of different voltages." R. Helibrun. February 18th, 1914. (157,838.)
1,633. "Electric welding." R. Mack. November 5th, 1919. (157,922.)
1,639. "Thermionic oscillation generators, particularly for wireless signalling." Dr. E. F. Huth Ges. and Dr. B. Rosenbaum. July 24th, 1919. (157,928.)
1,989. "Electric gas lamps with glow discharge." Studien Ges. fur Elektrische Leuchtrohren. June 16th, 1920. (165,067.)
2,080. "Devices for the sparkless disconnection of an inductive resistance." F. Krupp Akt. Ges. February 12th, 1920. (158,873.)
2,416. "Casings for electrical apparatus." British Thomson-Houston Co., Ltd. (General Electric Co.). January 18th, 1921. (178,217.)
2,709. "Electric contacting devices for magneto electric machines." A. P. Pehrson and H. Lloyd. January 20th, 1921. (178,224.)
2,806. "Methods of and apparatus for measuring magnetic induction." British Thomson-Houston Co., Ltd. (General Electric Co.). January 21st, 1921. (178,226.)
2,889. "Means for preventing unauthorised removal or theft of electric lamps." J. A. Brook. January 22nd, 1921. (178,229.)
3,266. "Electric lighting systems for vehicles." S. V. Gramlich. January 25th, 1921. (178,234.)
3,492. "Electro-magnetic vibrating devices, especially for sound transmitters." Dr. W. Kunze. January 28th, 1921. (178,235.)
4,454. "Electric toasters or the like." Credenda Conduits, Ltd., and F. F. D. Davidson. February 8th, 1921. (178,246.)
4,772. "Automatic or semi-automatic telephone systems." Relay Automatic Telephone Co., Ltd. February 11th, 1920. (158,910.)
6,279. "Electric distribution systems." British Thomson-Houston Co., Ltd. (General Electric Co.). February 24th, 1921. (178,266.)
6,759. "Secondary electric batteries or accumulators." Chloride Electrical Storage Co., Ltd. (B. Ford). March 1st, 1921. (178,271.)
6,807. "Apparatus for the remote control of electric motors, lamps, and the like." L. Kardorff. March 1st, 1921. (178,272.)
7,998. "Electric heaters." G. Durando. March 14th, 1921. (Addition to 154,183.) (178,286.)
8,943. "Process for the manufacture of photo electric cells." T. W. Case. March 23rd, 1921. (178,300.)
8,944. "Photo electric cells." T. W. Case. March 23rd, 1921. (178,301.)
8,971. "Bobbins for use in electromagnetic apparatus." E. A. Watson and M-L Magneto Syndicate, Ltd. March 23rd, 1921. (178,302.)
10,823. "Inverse time-limit relays." W. H. Petersen and Allmanna Svenska Elektriska Aktiebolaget. April 13th, 1921. (178,319.)
17,179. "Electric controlling devices for prime movers." C. Leffler. July 5th, 1920. (165,786.)
20,186. "Electric battery lamps." M. L. Kaplan. July 27th, 1921. (178,375.)
21,439. "Cooling of electric generators driven by steam turbines." Maschinenfabrik Oerlikon. August 12th, 1920. (167,778.)
22,378. "Electrical yarn-gassing apparatus." Siemens Schuchertwerke Ges. December 18th, 1920. (173,210.)
24,501. "Electric time switch." V. A. J. Coriin. January 13th, 1921. (174,037.)
33,990. "Head lamps for automobiles." D. J. Ritchie. January 5th, 1921. (Divided application on 173,243.) (Cognate application 33,991/21.) (178,388.)

### 1922.

8,583. "Electric circuit interrupters." Metropolitan-Vickers Electrical Co. Ltd. March 24th, 1921. (177,539.)